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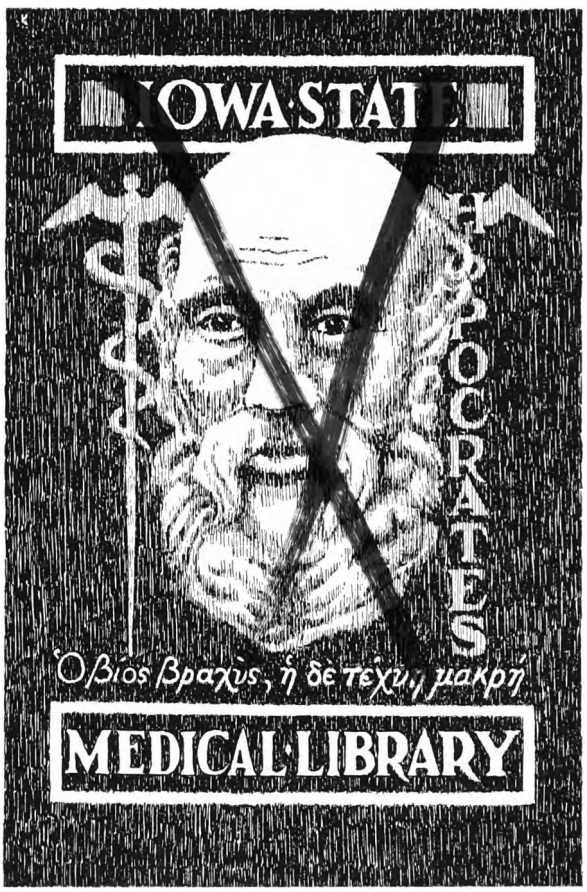

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AN EPIDEMIC OF ACUTE NEPHRITIS

JOHN FLEMING
M.D. Glasg., F.R.F.P.S.
PHYSICIAN TO GREENOCK ROYAL INFIRMARY

EARLY in 1945 there was a notable increase in the number of cases of acute nephritis admitted to this hospital. During the following months the high incidence was maintained and took the proportions of an epidemic. This continued with little variation till late in 1946, when the number fell to the low average of the three years before 1945, and during 1947 and 1948 there has been no increase over the former average.

A special effort was made to admit every case with much œdema, but this dealt only with the more severe cases. An inquiry among doctors in the area showed, at a conservative estimate, that for every case of acute nephritis admitted there were at least five with milder symptoms treated at home.

GEOGRAPHICAL DISTRIBUTION

The hospital serves an industrial and residential area with a population of 100,000. Industry and the congested tenements of the working population occupy a narrow coastal plain between the river and a parallel barrier of hills. Towards the west there is more open country, where are situated the new municipal housing estates and the villas of the well-to-do. With few exceptions, the patients came from the tenements of the industrial area. This separation into two distinct zones was complete during the first nine months of 1945, but during the remainder of the epidemic a few cases came from the previously immune areas—i.e., the west end of the town and new housed groups at the periphery of the industrial area.

During the whole two years' survey it was found that most of the patients came from a number of well-defined areas (see figure). These corresponded to the most congested groups of tenement buildings, and in general the poorest localities contributed the largest number of patients. From five streets we received 5–10 patients each; from two households there were 2 patients each, and from a third 3.

THE CASES

During 1945 the cases were treated on orthodox lines without chemotherapy, but it was realised that the unusually large numbers offered opportunity to assess the value of penicillin, and from April, 1946, all cases were treated with penicillin.

All the cases selected fulfilled the criteria for a diagnosis of acute glomerulonephritis with œdema (Ellis's type I) with no history or clinical signs of previous renal disease. 103 cases admitted in the winter of 1945 and early months of 1946 were selected as controls, and the 56 cases following these were given penicillin. These cases were in continuous sequence during the period of survey.

Of the total 159, 61 were females and 98 males:

Age (years)	*Males*	*Females*	*Total*
1–9	2	2	4
10–19	16	11	27
20–29	25	14	39
30–39	16	18	34
40–49	25	10	35
50–59	9	5	14
60–69	4	1	5
70–79	1	—	1
Total	98	61	159

In the no-penicillin group there were 35 females and 68 males, and in the penicillin group 26 females and 30 males.

The maximal incidence was in the age-group 20–50. There were very few infants and children. This suggests that there was no association with the infectious diseases conducive to nephritis—e.g., scarlet fever and diphtheria. The statistics of the Medical Officer of Health show that the incidence of these diseases in 1945 and 1946 was not greater than in the two preceding years and in 1947. Similarly there was no exceptional incidence of tonsillitis or pneumonia.

Apart from trench or war nephritis, group incidence of nephritis has been described mainly among communities of children.

ASSOCIATED INFECTIONS

Among the 159 cases of this survey a considerable number had an associated infective lesion. Of the 56 *penicillin* cases 14 had a pneumonic consolidation demonstrated by X rays, and 5 of these had a throat infection due to the hæmolytic streptococcus. 10 patients had an acute bronchitis with cough but little or no sputum, and 2 of these had a streptococcal throat. Few complained of sore throat after admission, but 15 had hæmolytic streptococci in profuse growth demonstrated by throat swab. 7 gave a history of an upper respiratory infection in the preceding four weeks: 2 had sore throat and 5 bronchitis. Thus 46 (82%) had an associated infection which could reasonably be related to the incidental nephritis.

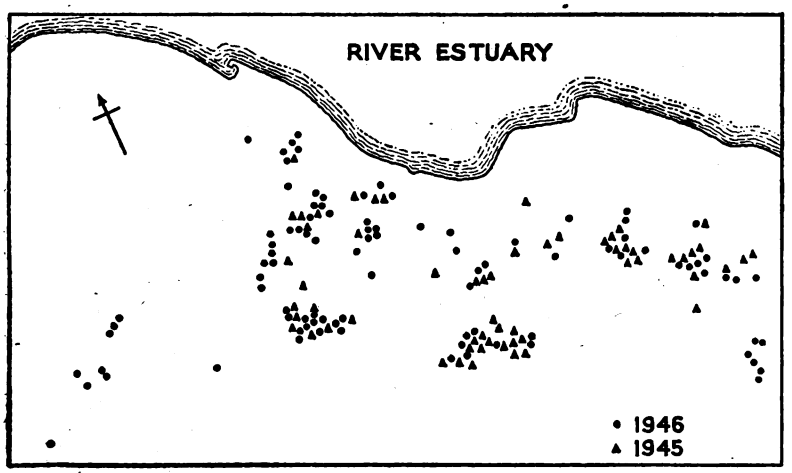
Though no obvious change was noted in the average severity of the nephritic symptoms during the survey, the figures suggest that these penicillin-treated patients were subject to a heavier incidence of infection than the earlier patients who were not given penicillin, and that the infection had gained in virulence as the epidemic progressed, for the earlier series show a much lighter incidence of associated infections.

Of the 103 *no-penicillin* cases, 10 had pneumonic consolidation, and 5 of these had hæmolytic streptococcus in the throat, 14 had acute bronchitis, 13 had throat swabs positive for hæmolytic streptococcus, and 31 gave a history of upper respiratory infection in the preceding four weeks. A history of sore throat was obtained from 20, and 11 had had bronchitis.

This means that of the 103 earlier cases, 68 (66%) had an associated infection, while the later 56 penicillin-treated cases had 48 (82%) with an associated infection.

Throat Infections

As a routine the throats of all the patients were swabbed on admission. 50



Distribution of cases of acute nephritis.

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were reported positive, with a growth, usually profuse, of hæmolytic streptococci. The 22 patients who gave history of sore throat had negative swabs on admission, whereas of the 50 who had positive swabs, only 3 complained of sore throat.

The patients who had positive swabs on admission were re-swabbed weekly. Even without chemotherapy most of the swabs were negative a week after admission, and all by the second week.

Bronchitis

24 patients were admitted with cough and slight fever, but there was no sputum; and, except for 2 with streptococcal throats, there was no evidence of the nature of the infection.

Pneumonia

Before the start of this survey several patients had been found to have areas of pulmonary consolidation. All the patients in the survey were therefore radiographed, and in 24 pulmonary consolidation was found. Cases 1–3 are typical cases of afebrile pneumonia.

Case 1.—A boy, aged 15, was admitted with three days' swelling of the face and cough associated with substernal pain. His urine contained blood and albumin, and his blood-urea level was 43 mg. per 100 ml. There were no abnormal physical signs in the chest, but X rays showed consolidation in the cardiophrenic angle and involving the left lower lobe. There was no cough or sputum after admission, and a throat swab grew only a mixed flora. The leucocytes numbered 6000 per c.mm. Œdema cleared on the fifth day, but traces of blood and albumin persisted in the urine for five weeks, and the blood-urea level was then 40 mg. per 100 ml.

Case 2.—A married woman, aged 46, had anorexia for three weeks and her vision became blurred. During the third week she had swelling of the face and developed breathlessness and severe headache. On the day of admission she felt nauseated and vomited frequently, and she then noticed for the first time that her urine was scanty and dark. She had no chest complaint, but her right lung was dull from the right scapular angle downwards, with breath sounds absent. Radiography showed consolidation of the right lower lobe, with some effusion. 10 ml. of serous fluid was withdrawn easily; on culture it was sterile. Œdema persisted for five days after admission, and blood cleared from the urine on the following day. Albumin was absent three weeks after admission.

There was no sputum or cough, and a throat swab was negative. The blood-urea level was 35 mg. per 100 ml. on admission, and three weeks later the blood-pressure was 110/60. The leucocyte-count was 7500 per c.mm. Radiography three weeks after admission showed complete resolution of consolidation and fluid.

Case 3.—A riveter, aged 53, was admitted with five days' cough and swelling of the face and legs. He had retrosternal pain on coughing. On admission he had generalised œdema, with much swelling of the genitals. He had not noticed any diminution or darkening of his urine, and had no pain on micturition. There was no history of illness suggesting previous nephritis.

The patient had no sputum, but his throat was congested, and a swab produced a heavy growth of hæmolytic streptococci. On admission the blood-urea level was 39 mg. per 100 ml.; the blood-pressure was 160/76, but in ten days returned to normal—138/76. The leucocyte-count was 7000 per c.mm. on the third day, and 6000 on the eighth day. Radiography showed consolidation at the right base, which cleared completely two weeks after admission. The urine contained only a faint trace of albumin at this time and was clear two weeks later.

Cases 4–6 were febrile pneumonic cases.

Case 4.—A married woman, aged 55. Five days before admission she developed a cough which caused pain across the chest. On the second day she was dyspnœic and had swelling of the face, feet, and ankles. The œdema lasted for one day only, but she then developed pain in both lumbar regions and had some blurring of vision. On the day before admission the urinary output fell.

On admission there was no œdema; and, though the urinary output was low, there was no albumin or blood in the urine. The patient had a slight cough and a little mucous sputum, in which the predominating organism was *Streptococcus viridans*, though a throat swab produced hæmolytic streptococci. She had no chest complaint, but physical examination showed slight dullness at both bases with some râles. Radiography showed a central patch of consolidation in both the right upper and lower lobes.

Intermittent fever continued for twelve days after admission, reaching 102·2°F on the seventh day of illness. The highest of three leucocyte-counts was 9000 per c.mm. The consolidations were completely clear on the twenty-fifth day of illness, the right upper lobe being the last to clear. Blood and albumin appeared in the urine five days after admission, when the fever was settling. Profuse hæmaturia persisted for nine days, then cleared completely, and did not return, but a trace of albumin was still present two months after the onset. The blood-pressure was within normal limits throughout, and in the fourth week was 122/76, but the blood-urea level, which was 41 mg. per 100 ml. on admission, was 47 mg. four weeks later.

Case 5.—A man, aged 42. Three weeks before admission he developed a "feverish cold," with headache, general aches and pains, nasal catarrh, and cough with a little mucous sputum. His face became swollen a week before admission, and he felt breathless on exertion. About the same time his urine became scanty and dark. The day before admission he vomited and had severe headache behind the eyes, though his eyesight was normal. He had no past history suggesting nephritis.

On admission he had slight fever (maximum 101°F), which subsided on the fourth day. His urine was loaded with blood and albumin, and continued so for three months; it was not completely clear till six months after admission. The blood-urea was 60 mg. per 100 ml. on admission, 48 at end of three months, and 30 at six months. The blood-pressure was 177/84 on admission, and 148/85 three months later.

There were no symptoms or physical signs of a lung lesion on admission, but radiography showed consolidation at the left cardiophrenic angle and extending almost to the periphery. There was also some patchy consolidation at the right base. There was no cough or sputum, and a throat swab was negative for hæmolytic streptococcus. A leucocyte-count at the height of the fever was 5000 per c.mm. Though this consolidation was one of the densest of the series, the chest was completely clear radiologically three weeks after admission.

Case 6.—A married woman, aged 38, had had an attack of acute nephritis when she was 26. She had been treated in this hospital, and the notes show that it was a mild illness with a complete recovery fourteen days after the onset. Since then the patient had had six pregnancies but had remained well on each occasion, and there had been no other illness suggesting nephritis.

Two weeks before admission she developed severe headache and swelling of the face. She had a severe sore throat and difficulty in swallowing. There were, she said, six ulcerated areas in the tonsillar region, the last of which "burst" and exuded pus. A week later she had epigastric pain and frequent vomiting. On the day of admission she noticed that her urine was dark, but there was no diminution in quantity. Œdema of her back and face appeared the same day, and her eyesight was impaired.

Immediately after admission she coughed up about 6 oz. of bloodstained mucus, from which profuse hæmolytic streptococci were cultured. She was very cyanosed and dyspnœic. Her temperature on admission was subnormal, but her respirations were 35, and her pulse-rate 130. Her chest was resonant except for some dullness at the extreme base, but râles were heard throughout. The white-cell count showed a polymorph leucocytosis of 18,000 per c.mm. The throat was ulcerated, and a swab grew profuse hæmolytic streptococci. Radiography of the chest showed patchy consolidation of both lungs, especially the right, with a small effusion at the left costophrenic angle.

On the day after admission the temperature was 100°F, the respirations were 48, and the pulse-rate almost uncountable, but more than 150. There was an immediate response to penicillin, and next day the temperature was 99°F, respirations were 38, and pulse-rate was 130, but the patient

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was mentally confused. Three days later the curves were normal.

On admission the urine was loaded with blood and albumin. The blood-urea level was 104 mg. per 100 ml. and the blood-pressure 150/100. With subsidence of fever the urine became clear except for a haze of albumin and a few red blood-cells, and the blood-pressure was 132/90. A week later it was 114/78. The blood-urea was 38 mg., and the leucocyte-count 6000. The patient was now completely comfortable and had a good appetite.

She was discharged four weeks after admission. Her blood-pressure was then 114/78, and her urine was free from albumin and microscopically showed no blood or casts. Radiography showed clear lung fields except for a little patchy consolidation at the extreme left base. This had cleared completely a month later.

In 10 cases pneumonia was diagnosed clinically; in the remainder there were no physical signs of pleurisy or pneumonia. In 6 cases only there was slight mucous sputum (in 1 case bloodstained), and cough, if present, was minimal. The 6 sputa were examined bacteriologically. 1 patient who had hæmolytic streptococci in the throat had mucous sputum from which was grown a pure culture of *Strep. viridans* insensitive to penicillin. 1 patient had bloodstained sputum from which a profuse growth of hæmolytic streptococci was obtained. From the others a mixed flora was obtained with no predominating organism and characteristic of the normal flora of the upper respiratory tract. 10 other patients had hæmolytic streptococci in throat swabs, but only in 1 was there evidence that the consolidation was due to the same organism. In 2 cases the leucocyte-count was 10,000 and 18,000, but in the others it was normal. All but 6 had mild fever (less than 102°F) for an average of eight days (none more than ten days). It was no guide to the presence of a pneumonia, for 75 of the 159 patients had some fever, but in the pneumonic cases the temperature was higher and the fever more sustained. In many cases fever was present for only a few days after admission; hence a larger number may have been febrile before admission. The fever, with 1 exception (case 6), was not affected by penicillin, either in the pneumonic cases or in those with no evidence of pneumonia. The findings suggest that the consolidations were not of hæmolytic streptococcal or pneumococcal origin, and in other respects they seemed to qualify for that equivocal designation "atypical pneumonia."

EFFECT OF PENICILLIN IN GENERAL

The duration of œdema, hæmaturia, and albuminuria was studied in the cases treated with penicillin, compared with the no-penicillin cases. The duration of illness was estimated, taking as its termination the constitutional recovery in association with normal blood-pressure and blood-urea level, with clear urine or minimal albuminuria. The results are shown in the table. This table shows a slight balance in favour of the penicillin cases, but there are so many variables that it cannot be regarded as significant.

DURATION OF ILLNESS AND CERTAIN SYMPTOMS IN RELATION TO TREATMENT WITH OR WITHOUT PENICILLIN

—	No penicillin (98 cases)		Penicillin (56 cases)	
	Duration (days)			
	Average	Extremes	Average	Extremes
Œdema ..	16	2 and 80	13	3 and 60
Hæmaturia ..	22	2 and 95	25	4 and 69
Albuminuria ..	42	5 and 190	38	4 and 90
Illness ..	49	9 and 221	40	8 and 94

BLOOD-UREA

In 56 cases treated with penicillin and 56 without penicillin the blood-urea was estimated on admission, midway, and shortly before discharge. The following results were obtained:

Blood-urea level	*No penicillin*	*Penicillin*
Normal and unaltered during treatment ..	32	32
High on admission, but returned to normal	9	20
Increased during treatment	15	4

The balance is again in favour of the penicillin cases, and perhaps more significantly.

Sen (1946) states that in most of his 12 cases the urinary output improved remarkably after treatment with penicillin. In this series sudden diuresis took place shortly after penicillin in some cases, but this was by no means the rule, and among the no-penicillin cases there were comparable numbers with an early and dramatic diuresis.

DISCUSSION

In this series the 56 patients treated with penicillin each received 1,000,000 units intramuscularly in twice-daily doses of 100,000 units for five days. Sen (1946) treated 12 children, all of whom were critically ill. He had 1 death and claims that his results were encouraging. His dosage varied between 192,000 and 640,000 units. No larger group than that appears so far to have been published, and this series is offered as further evidence for penicillin treatment.

The hope that penicillin might be of use in acute nephritis was first voiced by Moncrieff (1944), but THE LANCET (1946), commenting on Sen's cases and those of Rapoport et al. (1946), who treated 33 children with sulphonamide, suggested that their results did not show any improvement as compared with Ellis's (1942) figures for his 225 cases collected before the days of chemotherapy.

Many of the published series of nephritis cases are concerned entirely with, or show a large proportion of, children. In an important paper Ramberg (1946) states that of 175 patients 69% were under the age of twenty-five and 46% under fifteen. The present series appears to be in a minority, since it is almost entirely composed of adolescents and adults. In the case of children there is evidence that the general prevalence of streptococcal illness, particularly scarlet fever, predisposes to a higher incidence of acute nephritis. In the Greenock area the figures of the Medical Officer of Health do not show any increase in the average notifications of scarlet fever or pneumonia in the two years preceding, or in the two years of, the high incidence of acute nephritis here reported. Nor was there any notable increase of influenza or streptococcal sore throat.

The large majority of these 159 patients had had no notable preceding infection. 62 had had sore throat, but only in 4 could it be described as acute tonsillitis. With most of them the onset was insidious, with malaise, followed by the rapid onset of headache, vomiting, aches and pains (often referred to the back), blurring of vision, and diminution of urinary output—all referable to acute disturbance of renal function.

Though the evidence for a preceding streptococcal infection was limited to 62 cases (39·6%), the high incidence in two consecutive years and the geographical grouping of the areas of origin leave little doubt that the main ætiological factor was infective and epidemic.

During the war of 1914–18 epidemic nephritis (trench fever) was a serious disability among all combatants in France. In the war of 1939–45 epidemic nephritis appeared among the German troops, especially those on the Eastern Front, but nephritis in any form was minimal among British troops, even in Iceland. This immunity is parallel to the very high standard of hygiene and amenities maintained by the British Forces. It is hard to avoid the conclusion that the civilian epidemic here described is in some measure associated with the

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poor hygiene, congestion, and overcrowding in the areas where it arose.

In the absence of other infection the streptococcus may be accepted at least as an important associate. It may well have been more frequent in the prodromal stage than the figures indicate, for previous histories are notoriously fallacious when more serious symptoms have supervened on lesser. In Ramberg's (1946) series there was no history of infection in 43 cases, but in 87 the illness followed acute tonsillitis, in 12 acute coryza, in 11 skin infections, and in 5 scarlet fever. The figures reflect the youthful age-groups of most of his patients, and he concludes that acute nephritis is mainly a disease of young people. This conclusion certainly does not apply to the present series.

In the great majority of cases it appears that the associated streptococcal infection precedes the onset of the nephritis, and is already waning when nephritis symptoms have become manifest. If the object in giving penicillin is to deal with the associated, possibly ætiological, infection, it seems that the best time has passed when nephritic symptoms appear. In most of this series the preceding infection was so mild that in itself it did not justify treatment with penicillin.

Pneumonia

The most interesting associated lesion was pulmonary consolidation, which was noted in 24 cases. Though acute nephritis is occasionally found as a complication of pneumonia, developing some days after the onset, it is an incident in an acute illness which is predominately pulmonary. The lung changes recorded in nephritis are usually attributed to œdema, and are met with commonly in chronic renal disease associated with left-sided heart-failure. Alvayay and Zarate (1947) state that similar appearances were found in their cases of acute glomerulonephritis. All their patients, however, had some enlargement of the heart, a fact which raises the question whether they had had previous attacks of acute nephritis.

In the 24 cases of this series with an associated "pneumonia" the shadows were localised and dense enough to justify this radiological diagnosis. There was little evidence, however, except in 1 case (case 6), that the consolidation was due to a bacterial inflammation of the lung. Fever was absent or minimal, there was no leucocytosis, the sputum was scanty and non-specific, and penicillin appeared to have no influence on the rate of resolution, which, with or without penicillin, was usually rapid and complete in two or three weeks. In most cases the consolidation cleared much more quickly than is usual in pneumococcal pneumonia of similar radiological density. These facts raised the query whether the opacities were really areas of pneumonia in the sense of true inflammatory consolidation.

The absence of leucocytosis or organisms in the congested tissue of the acute nephritic kidney gave origin to the concept that acute nephritis was a reaction to the toxic products of the streptococcus rather than to the streptococcus itself, and more recently it has been suggested (Cavelti and Cavelti 1945) that the streptococcus causes renal tissue to become antigenic, and that, when immunity develops, an acute antigen-antibody reaction takes place in the kidney. The thesis that the kidney reaction may be an allergic response to the streptococcal toxin has also gained some support, and Brown (1946) describes a case where Henoch-Schönlein purpura associated with nephritis was an expression of food allergy.

The only pneumonic case of this series which could reasonably be claimed as one of direct bacterial infection is case 6. In this case the symptoms, signs, and radiological findings conformed to a diagnosis of streptococcal pneumonia, which may well have been the primary lesion, with nephritis as a secondary complication. In all the other cases the pneumonic lesion was merely of secondary importance and appeared to have no influence on the course of the acute nephritic syndrome. It is therefore suggested that these lung lesions were areas of congestion and œdema of the same nature as the congestive lesion in the kidney, without leucocytic or fibrinous infiltration and therefore capable of rapid resolution.

Penicillin

The experience of this series does little to increase the hope that penicillin can notably affect the incidence, course, or outcome of acute glomerulonephritis. In a disease where the organism chiefly incriminated is highly sensitive to penicillin some helpful effect is to be expected, and the results in this series seem to reflect a slight influence. In most cases the streptococcus, when present, is found in the throat, and Rantz et al. (1947) have shown that in this region both sulphonamide and penicillin have little effect either on the duration of fever or of local infection; nor does it affect the carrier-rate, for many of their series became persistent carriers. This may be an additional reason for the relative failure of penicillin in acute nephritis. If the infection remains in the tonsillar bed it may continue to damage the kidney by toxic products in spite of a high blood-penicillin level. In this series the streptococcal throat infections were not severe or persistent, and all the patients had negative swabs on discharge.

The rational use of penicillin therefore seems to be limited to cases with evidence of an associated infective process—fever, leucocytosis, congested throat (especially when positive for the hæmolytic streptococcus), and signs of pneumonia. This statement applies mainly to cases seen in hospital. On the other hand, the general practitioner may be able to make better use of penicillin in acute nephritis if he can recognise the very earliest symptoms and start treatment at once. Many of the patients in this series had symptoms suggesting acute nephritis a week or more before admission.

SUMMARY

A series of 159 consecutive cases of acute glomerulonephritis is reviewed. All were admitted in 1945–46 to the medical wards of the local hospital serving a small industrial town.

The high incidence limited to two years, and the geographical distribution of the cases, suggest an infective epidemic.

Routine radiography revealed pulmonary consolidation in 24 (15%).

The association with streptococcal infections is examined with reference to ætiology and the value of penicillin therapy.

The first 103 cases had no specific treatment and are used as controls for the next 56 cases treated with penicillin. The clinical data show a small balance in favour of penicillin therapy; the reason for its relative ineffectiveness is discussed.

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STREPTOMYCIN AND PROMIZOLE IN MILIARY TUBERCULOSIS AND TUBERCULOUS MENINGITIS IN CHILDREN

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THE search for a specific cure for tuberculosis has led to the discovery of two types of therapeutic agents, the sulphones and streptomycin, which are effective to some extent in controlling tuberculosis in experiments on animals and in man.

Forms of disease which have a very high fatality-rate furnish the best clinical material for testing a new drug. Meningitis and acute generalised hæmatogenous dissemination are two forms of tuberculosis suitable for this purpose. A few isolated cases of spontaneous cure of tuberculous meningitis have been reported, but even the most optimistic reports acknowledge a case-fatality rate approaching 100%. Moreover, tuberculous meningitis is usually of short duration; hence the effects of a drug on it can be measured by prolongation of life as well as by cure. A greater number of spontaneous cures of acute generalised miliary tuberculosis have been reported, but the fatality-rate is still extremely high. In addition, the course of acute generalised miliary tuberculosis is usually longer than that of meningitis, thus making it more suitable for testing the efficacy of drugs which act slowly.

In the children's chest clinic at Bellevue Hospital, New York City, chemotherapy of tuberculosis began in 1944 with the use of 'Promizole' (4, 2′-diaminophenyl-5′-thiazolyl sulphone), which was first given in five successive cases of tuberculous meningitis. The children all died 6–25 days after treatment was initiated, and necropsy of the brains in two cases showed no demonstrable retardation of the disease. Similar results were reported by Madigan (1948) and Anderson and Strachan (1948) in the treatment of tuberculous meningitis with 'Sulphetrone.'

TREATMENT OF MILIARY TUBERCULOSIS WITH PROMIZOLE

Ten children with miliary tuberculosis have been treated with promizole. Three were treated for less than a month: (1) one, aged 4 months, died 16 days after treatment was begun; (2) one, aged 16 months, was removed from the hospital against advice after 12 days' treatment and is still alive 3 years later, small areas of miliary mottling being still present on radiograms made within the past 6 months; and (3) one, aged 4 months, was treated for only 26 days because of a temporary shortage of promizole and, 5 weeks after medication was stopped, developed a fatal tuberculous meningitis. Of the seven infants with acute generalised miliary tuberculosis treated for more than a month cases 1 and 2 (table I) died—one after 4½ months' and one after 7 weeks' therapy. The latter at necropsy showed extensive hæmatogenous tuberculosis and a very early tuberculous meningitis. Cases 3–7 showed gradual clearing of the miliary tuberculosis on radiography in 6–12 months after promizole had been started and have thereafter remained free from evidence of miliary tuberculosis. Details of cases 3–5 have already been published (Milgram et al. 1947, Lincoln et al. 1948b). These children are all leading normal lives at home 4 years after treatment was begun. Cases 6 and 7 are reported here.

Case 6.—A negro boy, aged 19 months, was admitted in October, 1946. Initial radiography showed infiltration in the left upper lobe and large mediastinal nodes. The spleen was palpable, and all superficial lymph-nodes were enlarged. Daily fever of 104°F was present, and a week after admission tuberculous serous meningitis was diagnosed because the boy became drowsy and irritable and developed twitching of the face and arms, bilateral ankle-clonus, and an inconstant Brudzinski sign. The cerebrospinal fluid (C.S.F.) showed 37 cells; protein was 21 mg., sugar 58 mg., and chloride 582 mg. per 100 ml. The picture of cortical irritation cleared within 10 days, but the high fever persisted; 3 weeks after admission papulonecrotic tuberculides were first seen, and these continued to appear for more than a month. Miliary mottlings were first definitely seen on radiography 8 weeks after admission, and a course of promizole 0·25 g. daily was begun on Nov. 23, 1946. The dose was increased gradually to 1·5 g. daily. By Jan. 1, 1947, the child's temperature had returned to normal, liver and spleen were barely palpable at the costal margin, and only the cervical nodes were enlarged. However, a few weeks later a small patch of chorioretinitis was found in the left eye.

It was not until June, 1947, after 6 months' promizole therapy, that radiography showed a complete clearing of the miliary mottling; 3 months later the mediastinal shadow had increased in width, but there was no return of the miliary nodules in the lungs. Moreover, there was further evidence of healing of the miliary tuberculosis in numerous small calcifications seen in the splenic area. Since the boy had also developed a tuberculous bursitis of the right knee, intramuscular streptomycin 1 g. daily was given for 78 days, in addition to the promizole. During streptomycin therapy the boy developed an area of rarefaction in the right tibia and another in the lumbar vertebræ as well as a nodular enlargement of the right epididymis. In March, 1948, 3 months after streptomycin had been discontinued, the bone lesion in the tibia had almost completely healed, the testicles appeared

TABLE I—RESULTS OF TREATMENT OF MILIARY TUBERCULOSIS WITH PROMIZOLE

Case no.	Sex	Age at diagnosis	Interval from diagnosis to clearing	Results	Development of meningitis	Other complications	Comments
1	M	2 yr.	..	Died after 43 days	No clinical signs; microscopic evidence of early leptomeningitis	0	Necropsy showed hyperplasia of thyroid and diminution of colloid
2	M	6 mos.	..	Died after 4 mos.	Spinal fluid: normal sugar and protein content day of death	0	..
3	F	2 yr.	7 mos.	Well 4 yr. 10 mos. later	0	0	..
4	F	4 yr.	7 mos.	Well 4 yr. 8 mos. later	0	0	..
5	M	6 yr.	12 mos.	Well 4 yr. 2 mos. later	0	Chorioretinitis. Tuberculous spine. Bacilluria	Spinal fusion in May, 1948
6	M	20 mos.	6 mos.	Good condition 2 yr. 1 mo. later	0	Chorioretinitis. Epididymitis. Tuberculous spine and knee	All lesions arrested except tuberculous spondylitis; spinal fusion in January, 1949
7	F	2 yr.	7 mos.	Well 2 yr. 2 mos. later	0	0	..

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TABLE II—RESULTS OF TREATMENT OF MILIARY TUBERCULOSIS WITH STREPTOMYCIN AND PROMIZOLE *

Case no.	Sex	Age at diagnosis	Interval from diagnosis to clearing	Results	Development of meningitis	Other complications	Comments
8	M	11 yr.	7 weeks	Good condition 21 mos. later	One week	Tuberculous spine and ulna	Case 19 (table III)
9	M	4 yr.	7 weeks	Died 11 mos. later of meningitis	First episode 12 wks.; relapse 19 wks. later	0	Case 20 (table III)
10	F	5 yr.	10 weeks	Well 13 mos. later	0	Thrombopenic purpura	..
11	M	9 mos.	8 weeks	Well 12 mos. later	0	Endobronchial tuberculosis with collapse of right middle lobe	..
12	F	8 mos.	18 weeks	Well 12 mos. later	On admission	0	Case 26 (table III)
13	F	8 mos.	8 weeks	Well 9 mos. later	0	0	..
14	M	6 mos.	..	Died after 6 days	0	0	..
15	M	13 mos.	12 weeks	Well 8 mos. later	Six weeks	0	Case 28 (table III)
16	F	23 mos.	6 weeks	Well 4 mos. later	0	Endobronchial tuberculosis with collapse of right middle lobe	..
17	M	20 mos.	8 weeks	Well 4 mos. later	0	0	..

* Consecutive unselected cases.

normal, and examination of the optic fundi was negative, but the mediastinum still appeared widened on radiography and there was increased evidence of tuberculous spondylitis.

The boy is still receiving promizole 0·5 g. daily, on which he maintains a blood-promizole level of 2–3 mg. per 100 ml. He is afebrile and has gained 12 lb. during his 2 years' stay in hospital. Chest radiograms show persistence of the primary focus with minimal calcification. The tuberculosis of the lumbar spine continued to progress, and a spinal fusion was performed in January, 1949.

Case 7.—A negro girl, aged 2 years, was admitted in November, 1946. A tuberculin test had been negative in February, 1946. Radiography showed diffuse clouding of the right upper lobe and generalised miliary dissemination throughout both lungs. The liver was felt below the costal margin, and a hard spleen was palpable 4 cm. below the ribs. The only enlarged nodes were in the cervical region; tuberculides were present over the extremities. The child had a harsh cough and a wheeze, evidence of encroachment of tuberculous nodes on the bronchi. Promizole was given in increasing doses from 0·5 to 3·0 g. until a blood-promizole level of 1–3 mg. per 100 ml. was established. The child contracted measles in February, 1947, and after this she developed a general enlargement of all the superficial lymph-nodes and an increase in the pressure cough. By June, 1947, radiography showed complete clearing of the miliary mottling, and the liver and spleen were no longer palpable. She was discharged home in September, 1948, and has maintained adequate blood-promizole levels on promizole 0·75 g. daily during the past year.

It is planned to continue promizole therapy of these cases for an arbitrarily chosen period of 3 years. The decision to continue chemotherapy for a long time was based originally on the experimental work of Feldman et al. (1942) and Medlar and Sasano (1943), who showed that relapses were frequent in animals apparently cured by 'Promin,' and that viable tubercle bacilli persisted in the spleens of apparently cured animals. To prolong bacteriostatic action in our patients treatment is continued after the miliary tuberculosis has apparently been arrested.

Toxicity.—The only evidence of toxicity due to promizole shown by either of these children (cases 6 and 7) was slight cyanosis and the usual evidence of the goitrogenic action of promizole: their thyroid glands became enlarged 2 and 5 months after the first administration of promizole. In addition, the girl (case 7) developed enlarged nipples after 5 months' therapy. Blood-cholesterol levels were as high as 400 mg. per 100 ml. in both cases but have become lower on administration of desiccated thyroid gland. Both children showed much abdominal distension, which was also noted in two other cases of miliary tuberculosis treated with promizole. Possibly this symptom may ultimately be explained as evidence of promizole toxicity, analogous to that described by Menten and Andersch (1943) and Andersch (1943) with sulphonamides. Another possible but unproven result of promizole therapy occurred in case 7, whose cardiac shadow appeared enlarged on radiography soon after her thyroid had enlarged. This increase in heart size may have been due to a temporary cretinoid state or possibly to a direct toxic effect of promizole. The heart size returned to normal while the child was under therapy with desiccated thyroid gland.

COMBINED THERAPY WITH STREPTOMYCIN AND PROMIZOLE

When streptomycin became available in Bellevue Hospital in December, 1946, it was obvious that it was far superior to any therapeutic agent used previously in tuberculosis. We therefore decided to use streptomycin in the treatment of miliary tuberculosis and tuberculous meningitis in combination with promizole. There were many reasons for using more than one drug. Smith et al. (1946) had shown that the simultaneous use of a sulphone and streptomycin in guineapigs produced therapeutic results beyond the simple summation of the effects of the two drugs. It was hoped that the use of two different types of therapeutic agents would delay the development of resistance to the drugs. To get the greatest advantage from combining another agent with streptomycin it seemed reasonable to use a second drug which by itself had a beneficial effect on the course of tuberculosis. Therefore promizole was used. Evidence of the rapid effect of streptomycin compared with that obtained with the sulphone was impressive. Streptomycin is unsuitable for long treatment because of its potential toxicity and the tendency of the tubercle bacillus to become resistant relatively soon. Moreover, we had learnt from a study made before the days of chemotherapy that over 70% of children with meningitis associated with manifest primary tuberculosis also presented radiological or post-mortem evidence of hæmatogenous dissemination (Lincoln 1947). For this reason it was decided that meningitis as well as miliary tuberculosis should be treated for a long time. By the simultaneous use of streptomycin and promizole advantage could be taken of the rapid action of the antibiotic. Therapy could then be continued with the sulphone, which can apparently be given safely and effectively for years.

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TREATMENT OF MILIARY TUBERCULOSIS WITH STREPTOMYCIN AND PROMIZOLE

The results of combined treatment of miliary tuberculosis with streptomycin and promizole in cases 8–17 are summarised in table II.

Ten children with miliary tuberculosis (cases 8–17) were treated with both drugs. One died 6 days after therapy was begun, and a second, after recovery from miliary tuberculosis, died of tuberculous meningitis. The remaining eight patients remain well 4–21 months later. All but one of the cases surviving received intramuscular streptomycin 1 g. daily for 120 days; case 11 received only 0·4 g. daily. All the children received promizole by mouth four times daily in amounts sufficient to secure a blood-promizole level of 1–3 mg. per 100 ml. It is planned to continue the administration of promizole for three years.

The group of cases is very small, but in comparing the group treated with promizole alone with the children treated with both streptomycin and promizole several differences were noted. With the addition of streptomycin the rate of disappearance of the miliary mottling seen on radiography was much more rapid. It may be only coincidence that none of the seven children with miliary tuberculosis treated with promizole alone developed clinical meningitis. Post-mortem examination of the brain in one of the fatal cases showed microscopical evidence of early leptomeningitis. The miliary tuberculosis did not relapse in any of the patients treated with promizole, whether or not streptomycin was given in addition.

TREATMENT OF TUBERCULOUS MENINGITIS WITH STREPTOMYCIN AND PROMIZOLE

Streptomycin is the first therapeutic agent that has consistently altered the usual course of tuberculous meningitis. Increasing numbers of survivors have been reported both in the United States and elsewhere. Because the survival-rates of other observers have changed after further periods of observation, we publish here illustrative case-records selected only from cases followed for at least a year—i.e., patients admitted between December, 1946, and January, 1948. These include seven cases previously reported in February, 1948 (Lincoln et al. 1948a). For purposes of completeness, however, all the patients admitted up to Dec. 1, 1948, and their present status are included in table III.

Eighteen patients with tuberculous meningitis (cases 18–35) have been treated, of whom five have died, including the child who died of meningitis after recovery from miliary tuberculosis. Ten of the children have survived more than 6 months. The most encouraging finding, however, is that so far none of the children who have survived meningitis have been left badly crippled either physically or mentally.

Dosage

Intramuscular streptomycin has been given in doses of 0·5–2 g. daily, depending on the age and size of the child, but no attempt has been made to give it on a weight basis. In our more recent cases we have not exceeded 1 g. daily. This is usually given twice daily: 0·5 g. at 8 A.M. and 4 P.M. A single daily dose can be given comfortably to large or well-nourished children. Intramuscular streptomycin is continued for 180 days. In addition, intrathecal streptomycin 0·1 g. is given once daily until toxic symptoms or mechanical difficulties arise. Thereafter 0·1 g. is given every two days; but, if toxic symptoms again arise, 0·05 g. is given every two or three days until 40 injections have been given.

Promizole is given by mouth 6-hourly. The initial dose of 1 g. daily is given for several days. In the absence of signs of toxicity a gradual step-like increase from 1 to 2 g. or higher is then made every few days or weekly until therapeutic blood-promizole levels (1–3 mg. per 100 ml.) are obtained. Treatment with promizole is continued for 3 years. In the event of relapse the full course of both intramuscular and intrathecal streptomycin is repeated.

TABLE III—RESULTS OF TREATMENT OF TUBERCULOUS MENINGITIS WITH STREPTOMYCIN AND PROMIZOLE *

Case no.	Age at onset	Chest radiogram and other evidence of tuberculosis	No. days treated	Total streptomycin (g.)	Biggest daily dose of promizole	Results
Admitted before Feb. 1, 1948:						
18	9 mos.	Primary	66	42·0	1·5	Hydrocephalus on admission; died on 66th day of treatment
19	11 yr.	Miliary; spondylitis	183	278·0	6·0	Spinal fusion after recovery; well 21 mos. after meningitis
20	4 yr.	Miliary	176 109	229·0 163·0	4·0 4·0	Died during relapse 11 mos. after onset of miliary
21	3 yr.	Primary	191	207·0	2·0	Well 20 mos. after meningitis
22	2 yr.	Primary	188	106·0	6·0	Well 19 mos. after meningitis
23	6 yr.	Primary	201	249·0	4·0	Well 18 mos. after meningitis
24	23 mos.	Primary	183	186·0	6·0	Well 16 mos. after meningitis
25	3 yr.	Calcified primary	182 180	319·0 183·0	4·0 8·0	Relapsed 43 days after completing treatment; spastic paralysis of right arm; deaf; 14 mos. since onset
26	8 mos.	Miliary	203	199·0	4·0	Spastic paralysis of right arm; otherwise well 12 mos. after meningitis
27	5 yr.	Calcified primary	180 133	246·0 138·0	4·0 8·0	Relapsed 45 days after completing treatment; atrophy of left leg, with foot-drop; 12 mos. since onset
Admitted after Feb. 1, 1948:						
28	13 mos.	Miliary	222	140·0	4·0	Survival in good condition 7 mos. after onset
29	6 yr.	Calcified primary	180	184·0	6·0	Survival in excellent condition 7 mos. after onset
30	10 mos.	Primary	10	11·0	2·0	Died on 10th day of treatment
31	11 mos.	Primary	18	17·0	2·0	Died on 18th day of treatment
32	15 mos.	Primary	175	177·0	4·0	Survival in good condition 6 mos. after onset
33	5 yr.	Calcified primary	157	161·0	4·0	Survival in good condition 5 mos. after onset
34	13 mos.	Primary	39	34·5	2·0	Died on 39th day of treatment; exfoliative dermatitis
35	2 yr.	Calcified Primary	81	82·0	6·0	Survival; doing well 3 mos. after onset

* Consecutive unselected admissions.

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Though the general plan of treatment was the same in each case, individual variations were inevitable. Toxic reactions sometimes required interruption of treatment for several days or weeks. Originally it was planned to give intrathecal streptomycin for 2 months, at first daily, as long as tolerated, and then on alternate days or every 3rd day. This led to so much variation in the number of intrathecal injections (24–49) that it was decided arbitrarily to give 40 of them.

Toxic Effects of Streptomycin and Promizole used Together

The toxic effects of promizole when given alone have been mentioned above and have been discussed by Milgram et al. (1947) and Lincoln et al. (1948b). When promizole is given with streptomycin, there seems to be less evidence of toxic reaction to it in both miliary tuberculosis and tuberculous meningitis. Most of the children have been slightly cyanotic; a few have developed slight enlargement of the thyroid gland with an elevation of the blood-cholesterol level. One girl aged 6 years, with meningitis (case 23) has shown enlargement of nipples and breast development after eight months' therapy. A cherry-red or pink urine continues to appear at some time in all patients receiving promizole whether given alone or combined with streptomycin.

The toxic reactions to streptomycin have been similar to those reported elsewhere. Vomiting was frequent and in one patient so severe that therapy had to be temporarily discontinued. Four children had generalised papular or urticarial eruptions, in two cases associated with, or followed by, eosinophilia. In one patient the rash developed into exfoliative dermatitis (case 34). One child showed temporary elevation of the non-protein nitrogen content of the blood associated with cylindruria. The most constant toxic reaction was ataxia. Every patient showed some degree of unsteadiness after 3 or 4 weeks' treatment. Clinically every child who recovered has made an apparently adequate adjustment to any damage he may have sustained to the semicircular canals. All of them romp and play like normal children. Recently, for the first time, we have been able to secure satisfactory caloric stimulation tests even on our youngest patients, and we have found that response to stimulation is invariably lost, sometimes as early as the 2nd week of therapy.

After treatment with intrathecal streptomycin increased vertigo, ataxia, transient nystagmus, and strabismus, as well as projectile vomiting, may develop within 1–4 hours. Occasionally opisthotonus, convulsions, muscle rigidity, or sudden high temperature may develop. After these more severe reactions the patient may become drowsy and fall into a quiet sleep. On awakening, there is usually full recovery from these alarming symptoms, though complete loss of reflexes, with muscle flaccidity, may be present for 24 hours or more. We have been unable to secure satisfactory audiograms in most of our cases and therefore cannot evaluate possible damage to the hearing apparatus. One patient with meningitis became blind and deaf during the first month of treatment with streptomycin. Vision and hearing were ultimately completely restored. Two other patients with meningitis became deaf while under treatment, but one has shown improvement in hearing after streptomycin therapy was finished. We do not know whether in these cases the deafness was due to meningitis or was caused by streptomycin.

Promizole Content of Blood and Cerebrospinal Fluid

The promizole content of blood and cerebrospinal fluid (C.S.F.) varies greatly. After a single dose of promizole by mouth, peak blood-promizole levels are reached in 2–4 hours. There is no apparent relation between the dosage, the weight of the child, and the blood-promizole levels. Children aged 2–5 years will often show high blood-promizole levels on small doses (0·5–2·0 g. daily), whereas younger infants and older children may require 3–6 g. daily to attain therapeutic levels. Some patients will, at times, reach equivalent values in blood and C.S.F.; more often the C.S.F.-promizole level is only a fraction of the blood-promizole level. C.S.F.-promizole levels are not influenced by the presence or absence of meningitis or by the severity or stage of the disease.

Our experience with the streptomycin content of blood and C.S.F. is incomplete, but enough evidence has been collected to indicate that, as the tuberculosis subsides, the C.S.F.-streptomycin level tends to decline while the blood-streptomycin level may remain stationary. With clinical improvement several patients in this series who were still receiving intramuscular streptomycin have shown a decline in the C.S.F.-streptomycin level. One patient who relapsed showed a higher C.S.F.-streptomycin level than the one obtained near the end of the original course of therapy. Zero C.S.F.-streptomycin levels (Price method) were repeatedly obtained in five patients treated with intramuscular streptomycin who at no time showed any clinical or laboratory evidence of meningitis. Streptomycin levels of 5–40 μg. per ml. were obtained in two patients with miliary tuberculosis some time before a definite diagnosis of meningitis was established.

C.S.F.-protein levels remained high in only three patients after the end of the streptomycin course; two of these relapsed. The number of cells varied greatly but returned to normal in all survivors before the course of intramuscular streptomycin had been completed. C.S.F.-chloride levels declined too slowly and too late to be of diagnostic or prognostic significance. C.S.F.-sugar levels were normal in four cases when meningitis was diagnosed. Three of these were cases of miliary tuberculosis, and two of them were already receiving intramuscular streptomycin. This masking of meningitis in miliary tuberculosis by a normal C.S.F.-sugar level has led us to search for other tests by which meningitis can be diagnosed early. In addition to C.S.F.-streptomycin levels, the Levinson test and colloidal gold curves may be helpful aids in early diagnosis of meningitis as well as possible indices to prognosis or temporary arrest of the disease. In the absence of meningitis the Levinson test was negative and the colloidal gold curve normal. Such aids may be particularly important in the early recognition of relapse. In the three patients who relapsed the diagnosis was made by C.S.F. changes before any clinical evidence of meningitis was apparent.

The trend of these three tests—C.S.F.-streptomycin levels, Levinson, and colloidal gold—may also help in determining the duration of therapy. In eight of nine survivors followed more than 6 months the Levinson test was negative. These three tests were negative as early as the 4th month of treatment in at least one patient.

Tubercle bacilli fully sensitive to streptomycin were cultured from the C.S.F. of the three patients with meningitis who relapsed. Each had received 6 months' treatment with streptomycin and promizole. After 2 months' further streptomycin therapy tubercle bacilli resistant to streptomycin were obtained on culture in case 20. The patient developed clinical meningitis soon afterwards and died 8 weeks later. Tubercle bacilli had been cultured from the blood of this boy during his initial period of miliary tuberculosis 9 days after intramuscular streptomycin had first been given. It has been established that organisms are more likely to become resistant to a drug when there is a large population of them.

Clinical Course of Tuberculous Meningitis under Treatment

Except for one child who improved steadily after treatment was begun, the course of tuberculous meningitis

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during the first weeks' therapy was similar to that in untreated patients. Even when streptomycin and promizole were given early in meningitis, there was usually no immediate response. The child often developed the neurological pattern of the second stage of meningitis, and under therapy this stage lasted from 2 weeks to several months. Even the third, or comatose, stage of meningitis developed under treatment in patients who ultimately recovered. Fever declined slowly and often persisted for several months. Gain in weight and strength often accompanied a decline in temperature during the second month of therapy. Evidence of cranial nerve involvement cleared slowly. Diminished and even absent superficial and deep tendon-reflexes persisted in some cases until some time after all streptomycin therapy had been concluded. Residual pareses continued to improve long after streptomycin therapy was discontinued.

ILLUSTRATIVE CASE-RECORDS

Case 19.—A boy, aged 11 years, was transferred from another hospital with tuberculosis of the right forearm with draining sinuses from which tubercle bacilli were cultured. Radiography of his chest showed paravertebral infiltration and extensive destructive spondylitis in the mid-thoracic spine. The patient was placed on a Bradford frame. Six weeks later radiography of the chest showed definite generalised miliary tuberculosis. C.S.F. and neurological examinations were normal.

Promizole was given by mouth, and a week later the patient complained of headache, vomiting, photophobia, and diplopia. Left external strabismus was present; neurological examination was otherwise normal. C.S.F. contained 240 cells per c.mm., predominantly mononuclears; protein was 100 mg., sugar 40 mg., and chloride 659 mg. per 100 ml.

Streptomycin therapy was started. Signs of meningeal irritation promptly subsided, but an irregular septic type of temperature continued until the course of intrathecal streptomycin was completed. At the end of 2 months' combined therapy the pulmonary miliary opacities had disappeared. Sinus tracts of the forearm ceased draining after six weeks. The dorsal vertebræ showed no improvement under streptomycin therapy, and the patient was placed in a plaster-of-paris body cast. External strabismus persisted for 6 months.

Convalescence was asymptomatic, afebrile, and uneventful until February, 1948 (10 months after the onset of meningitis), when the patient complained of intermittent abdominal pain. The pain became progressively more severe. The cast had been removed for closer observation. There was no fever, nausea, or vomiting, and the white-cell count was normal. Laparotomy was performed under general anæsthesia. There was dry adhesive peritonitis. The appendix was twisted on itself and adherent to the cæcum. Firm pin-head nodules were seen on the appendix, and others were seeded throughout the bowel. Microscopical sections showed these to be fibrocaseous nodules with calcification. Intramuscular streptomycin was given for the postoperative period. A body cast was again applied. In August, 1948, a first-stage spinal fusion was performed, and a second-stage fusion followed in October. All components of the C.S.F. have remained normal since September, 1947.

Case 20.—A boy, aged 4 years, had recurrent sore throat, epistaxis, joint pains, and irregular temperature as high as 105°F for about a month. A Mantoux test was positive. Radiography of the chest showed miliary tuberculosis with enlarged hilar nodes. Miliary tubercles were seen in the optic fundi. Tubercle bacilli were cultured from the blood 9 days after streptomycin and promizole therapy had been started. After 6 weeks there was no further evidence of miliary infiltrations, and irregular pigmented patches dotted the areas in the fundi in which tubercles had previously been seen.

By the end of the second month the temperature had again risen. The C.S.F. remained normal. Specific therapy was temporarily discontinued; since there was no decline in temperature, therapy was again resumed. A week later the patient vomited and complained of headache and photophobia. He was irritable but fully conscious. Neck rigidity, positive Kernig's sign, and bilateral ankle-clonus were elicited. The C.S.F. contained 413 cells per c.mm.; protein was 124 mg., sugar 30 mg., and chloride 836 mg. per 100 ml. Tubercle bacilli were seen on direct examination and later in culture and on guineapig inoculation.

Intrathecal streptomycin therapy was started. The acute symptoms subsided rapidly. Before therapy was completed the spinal fluid returned to normal, temperature subsided, and, except for a mild ataxia which did not interfere with normal activity, the child was well and even attended nursery school occasionally.

The C.S.F. was examined weekly after streptomycin therapy had been completed, and during the 3rd week, though the patient remained clinically well and active, the C.S.F.-protein level rose to 52 mg. per 100 ml., and the C.S.F.-sugar level fell to 25 mg. During the 4th week the temperature rose and further C.S.F. changes were observed. Tubercle bacilli were cultured from the C.S.F.

Intramuscular and intrathecal streptomycin therapy was started 25 days after the previous course had been completed. The child became weak, and tired easily. There was loss of weight and appetite, and low-grade fever continued. The C.S.F.-sugar level returned to normal by the 48th day. Positive cultures were again obtained on the 42nd and 59th day of treatment. Thereafter vomiting, anorexia, increased neck rigidity, irritability, and periods of somnolence became more frequent. The C.S.F.-sugar level fell progressively.

There was no further response to continued therapy, and the course of the disease thereafter presented the picture of progressive meningitis as seen in the period before chemotherapy. The patient deteriorated rapidly and died 117 days after relapse of meningitis. No necropsy.

Tubercle bacilli cultured from C.S.F. specimens obtained after the initial course of streptomycin had been completed were resistant to 2·5 μg. per ml. of streptomycin; cultures obtained after relapse on the 56th treatment day were resistant to 100 μg.; by the 85th day resistance to 500 μg. had developed.

This is the only patient of the series in whom any resistant strain to streptomycin has been isolated.

Case 22.—A boy, aged 2 years, was admitted with three weeks' history of fever, swelling of the cervical lymph-nodes, cough, and pronounced loss of weight and appetite. He was emaciated and chronically ill. The temperature on admission was 103·4°F. A Mantoux test was positive. Radiography of the chest showed widening of the mediastinum and enlarged left hilar nodes.

By the 6th hospital day somnolence, neck rigidity, positive Kernig's and Brudzinski's signs, and exaggerated reflexes were present. The C.S.F. contained 150 cells per c.mm.; protein was 275 mg., sugar 15 mg., and chloride 682 mg. per 100 ml. Acid-fast bacilli were seen on direct examination of the C.S.F. The child could be roused to take food and fluids, and cried when the extremities were moved. During the 3rd and 4th weeks of his illness he became blind and apparently completely deaf. Transient cylindruria and albuminuria appeared, and the non-protein nitrogen content of the blood rose to 53 mg. per 100 ml.

During the 2nd month a vegetative existence continued. Therapy was not interrupted, and by the 4th month vision and hearing were restored and there was progressive mental and physical improvement. Neurological examination revealed no abnormalities, and the child, before discharge to his home, attended nursery school daily for several months and played with other children. C.S.F. components have been normal since streptomycin therapy was completed, except for some slight fluctuation of C.S.F.-protein level. The Levinson test and colloidal gold curves are normal, and a recent encephalogram was interpreted as normal for age.

Case 25.—A boy, aged 3 years, a close contact to a tuberculous uncle during infancy, was admitted with twelve days' history of fever, increasing drowsiness, and projectile vomiting. Six weeks before admission he had had measles.

On admission the child was unresponsive except to painful stimuli, and there were well-marked signs of meningitis. On the 4th day of treatment he developed paresis of the left facial nerve, and during the 3rd week contractures of the right arm and both legs with foot-drop. Splints were applied and daily physiotherapy given to prevent further atrophy and deformity. There was loss of speech and progressive loss of hearing.

During the 4th month he became brighter and more alert; there was excellent gain in weight, muscle strength, and coördination. Progress was even more dramatic after streptomycin therapy had been completed. The child could stand and take a few steps with support. He could feed himself and played untiringly. A low-grade pyrexia developed,

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however, 42 days after streptomycin therapy had been completed, and on two examinations the C.S.F. contained increased amounts of cells and proteins and a diminished amount of sugar. Tubercle bacilli were cultured from the specimen obtained 3 days after intramuscular and intrathecal therapy had been re-established and were fully sensitive to streptomycin. During the first 2 weeks there was increased spasticity of the right arm, but this has improved with physiotherapy.

The child is now mentally alert and responsive. Electroencephalography shows evidence of a localised lesion in the left temporal region. Intrathecal streptomycin therapy was completed in mid-August, when a C.S.F. cell-count and the C.S.F.-sugar level were normal; the C.S.F.-protein level has progressively declined and at present is only slightly higher than normal. C.S.F.-streptomycin levels and colloidal gold curve declined to zero during the 3rd month.

Case 26.—A girl, aged 8 months, was transferred from another hospital with miliary tuberculosis and bilateral chronic otitis media. Neurological examination was normal. Twenty-four hours after admission the patient had a generalised convulsion, followed by paresis of the left facial nerve and weakness of the right extremities. There was a profuse purulent discharge from the left ear. The C.S.F. contained 180 cells per c.mm., with normal protein and sugar values. Intramuscular streptomycin and promizole by mouth were given for treatment of the miliary tuberculosis. Periodic C.S.F. examinations were made during the next few weeks; there was a gradual rise in protein content from 41 to 75 mg. per 100 ml., and the number of cells varied from 180 to over 500 per c.mm. Treatment was delayed because the sugar content remained between 40–50 mg. per 100 ml. and meningeal signs and symptoms were absent. On the 24th day of treatment with intramuscular streptomycin the C.S.F.-sugar level declined to 35 mg. and the initial C.S.F. cultures grew tubercle bacilli.

Intrathecal streptomycin was started; fever and irritability diminished; miliary opacities cleared over a period of $3^1/_2$ months, much more slowly than in other treated cases—possibly because the child developed measles during the 2nd month of treatment. C.S.F. values (including zero streptomycin level) returned to normal before treatment was completed, and the Levinson test and colloidal gold curves became normal a month after treatment was completed. The child has gained in weight and stature and remains mentally alert and playful. There is residual weakness of the right arm and hand and tightness of the hamstring muscle, but she is learning to walk and can hold on to the crib rails firmly with both hands.

DISCUSSION

Streptomycin has revolutionised the attitude of physicians to miliary tuberculosis and tuberculous meningitis. Instead of an occasional recovery being reported as a great rarity, groups of cases are regularly reported with a fair percentage of recoveries. Debré et al. (1947a) treated 31 children with miliary tuberculosis with streptomycin; 16 died and 7 others developed meningitis while under treatment. Bunn (1948) reported 25 treated patients; 7 developed meningitis, 5 of them during streptomycin therapy, and 2 three months after streptomycin had been discontinued. Of the 25 patients 9 were in good health 2–20 weeks after completion of treatment. Cathala and Bastin (1948) treated 21 patients, with 8 deaths; of 5 who had completed therapy 2 were fully recovered. Increasing numbers of survivors of tuberculous meningitis have been reported both in the United States and elsewhere. During the past year reports from various sources, such as the Medical Research Council (1948) in England, the Sick Children's Hospital in Paris (Debré et al. 1947b), and the Veterans Administration, the Army, and the Navy in the United States (Council on Pharmacy and Chemistry 1947), gave fairly uniform survival-rates (36%, 37%, 36%) four to six months after treatment had been started. Dubois et al. (1948) treated 26 patients; 21 were still alive at the end of five months. Illingworth (personal communication) treated 40 children; 6 remain well three to twelve months after the end of treatment. McDermott et al. (1947) treated 9 patients for 120 days; 7 died, and 2 were in good clinical remission five months after cessation of therapy. Recently McDermott (1949) has stated that sustained recoveries may be obtained in 10–15% of meningitis cases treated with streptomycin, with an additional 10% surviving in a badly crippled state.

The highest proportion of survivals from tuberculous meningitis have been obtained in therapy with streptomycin combined with a sulphone. Cocchi and Pasquinucci (1947) claimed good results in the treatment of tuberculous meningitis with streptomycin, promin, and large doses of vitamin A. Cocchi (1948) reported 107 patients with proved tuberculous meningitis who had survived the first days of observation; only 8 of the last 52 patients died. With treatment of miliary tuberculosis with the same agents Cocchi has stated that permanent cure may be obtained regularly.

From these reports and our own experience it seems evident that the combination of a sulphone with streptomycin is advantageous in the treatment of miliary tuberculosis and tuberculous meningitis. Promizole seems to be a valuable sulphone to supplement streptomycin. It has been shown to arrest miliary tuberculosis in children when used as the sole chemotherapeutic agent. Its relatively low toxicity and mode of administration permit it to be used for years. The results of recent studies at Duke University may possibly explain the difference in action between promizole and other sulphones. Pope and Smith (1949) studied the inhibition of the bacteriostatic effect of sulphones by para-aminobenzoic acid. They found that the concentration of para-aminobenzoic acid required for reversal of the activity of promizole was much higher than that required for other commonly used sulphones.

Early diagnosis may be one of the most important factors in the cure of tuberculous meningitis. In many cases the dangers of hydrocephalus and chronic meningitis can be avoided only by the early recognition of symptoms of meningitis and the prompt institution of treatment. Since the earliest symptoms are often general, such as vomiting, drowsiness, and fever, the cases which are most likely to be diagnosed early will occur in children who are known to be tuberculous.

Both miliary tuberculosis and tuberculous meningitis are usually early complications of primary pulmonary tuberculosis, occurring often within six months of the onset of tuberculosis. Therefore it is important that all children known to have a recent primary tuberculosis be kept under close observation even if the disease is asymptomatic. Meningitis should be suspected if irritability, apathy, and vomiting develop in association with fever. In infants a persistent fever may be the only warning of an impending miliary tuberculosis or meningitis. In such cases diagnostic lumbar puncture should be performed early. Excluding the finding of tubercle bacilli, the most characteristic change in the spinal fluid is a lowered sugar content. With a protein content over 50 mg. per 100 ml. or a sugar content below 50 mg. per 100 ml. with a moderate pleocytosis, predominantly lymphocytic, tuberculous meningitis should be suspected, and the C.S.F. should be re-examined within 24 hours. This will allow for rapid exclusion of ordinary pathogens such as influenza bacilli by culture and provide two cultures of C.S.F. for tubercle bacilli for later confirmation of the diagnosis. In the absence of growth within 24 hours and the presence of characteristic chemical changes in the C.S.F. of a tuberculous child treatment should be initiated.

The fact that even when patients are treated during the first stage of tuberculous meningitis they often develop the full neurological pattern of meningitis before showing improvement may be largely due to the irritant effect of intrathecal therapy. Certainly where only intramuscular streptomycin is used, as in miliary tuberculosis,

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good response to therapy is seen very much earlier than in meningitis. However, despite the fact that clinical remissions of meningitis have been reported on intramuscular therapy alone, the percentage of remissions is not high enough to justify its exclusive use. If meningitis cannot be prevented by intramuscular streptomycin alone, streptomycin by this route should not be advocated as a cure. Intrathecal therapy should probably be intensive to the point of toxicity from the onset to concentrate the drug where the need is greatest. Daily lumbar punctures are usually tolerated for one or two weeks before first signs of toxicity appear.

When a patient is under streptomycin therapy for miliary tuberculosis, clinical and laboratory evidence of a complicating meningitis may be obscured. In two of our cases the sugar content of the C.S.F. remained normal even when tubercle bacilli could be cultured from the C.S.F. It is in such cases that C.S.F.-streptomycin levels may be of special value. An increase in the level would reflect increased permeability of the meninges such as might occur with a developing meningitis.

SUMMARY AND CONCLUSIONS

Seven cases of miliary tuberculosis were treated with promizole. None developed clinical meningitis. Five patients have survived 2–4 years and are free from evidence of miliary tuberculosis.

Ten patients with miliary tuberculosis were treated simultaneously with streptomycin and promizole. One patient died after 6 days' treatment, and another of a relapse from meningitis 11 months after the initial diagnosis of miliary tuberculosis.

No relapse of miliary tuberculosis has occurred in the survivors of either group.

Eighteen patients with tuberculous meningitis were treated with intramuscular and intrathecal streptomycin and with promizole by mouth. Thirteen patients survive 3–21 months later. There have been no serious neurological sequelæ.

Three cases relapsed 25–43 days after completion of therapy. Tubercle bacilli fully sensitive to streptomycin were cultured from the C.S.F. of each of the three cases during the first week of relapse.

Relapses were diagnosed on the basis of C.S.F. findings in the absence of neurological signs and symptoms.

Evidence is presented that the addition of promizole to streptomycin is of value in the treatment of miliary tuberculosis and tuberculous meningitis.

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DECAMETHONIUM IODIDE (BISTRIMETHYLAMMONIUM DECANE DIIODIDE) IN ANÆSTHESIA

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As a result of the study of a series of polymethylene bistrimethylammonium compounds in six different species of animal, at the National Institute for Medical Research, Paton and Zaimis (1948) suggested the use of the decane derivative (decamethonium iodide) as a substitute for *d*-tubocurarine. Preliminary trials in volunteers having proved satisfactory (Organe et al. 1949), an investigation into its use in anæsthesia has been undertaken by a number of workers on behalf of the anæsthetics committee of the Medical Research Council and the Royal Society of Medicine. A full report will be published when this work is completed. The publication of the following interim report has been necessitated by the placing of decamethonium iodide on the market.

PHYSICAL PROPERTIES

Decamethonium iodide is a white crystalline salt, easily soluble in water, forming a neutral solution, sterilisable by heat, and stable. The formula is:

$$(CH_3)_3N^+.\ (CH_2)_{10}.\ N^+(CH_3)_3.\ 2I^-$$

It is a simple compound chemically, cheap, and easy to prepare in a pure state. It is miscible with the alkaloids, with procaine, and with thiopentone. It is non-irritant and may be injected into any tissue without sign of reaction.

PHARMACOLOGICAL ACTIONS

Injection of small doses into animals causes a neuromuscular block, which appears to affect skeletal more than respiratory muscles. The block is not affected by anticholinesterases such as neostigmine, but is antagonised by pentamethonium iodide (which is virtually devoid of curarising activity), probably through competitive inhibition. Decamethonium iodide has much less activity in liberating histamine or heparin (MacIntosh 1948) and has less activity in paralysing autonomic ganglia than has *d*-tubocurarine. Experiments on animals show a wide species variation of potency.

It is excreted, largely, in the urine. The fate of the remaining fraction is not yet known.

USE IN ANÆSTHESIA

Decamethonium iodide has been used at the Westminster Hospital in 150 operations of many different types, most of them being laparotomies, on patients aged 15–83. Preliminary trials having established that it is in every way a safe and satisfactory substitute for *d*-tubocurarine, it is now being used in unselected cases.

Dosage.—The total dose has been 1·5–10 mg. There is no clear relation between effective dose and bodyweight. A single intravenous injection of 3 mg. in light surgical anæsthesia produces, in most patients, good muscular relaxation without unduly depressing respiration. This dose may therefore be taken as approximately equivalent to 15 mg. of *d*-tubocurarine chloride. An injection of 4 mg. often, and of 5 mg. almost invariably, produces apnœa lasting usually ten, occasionally twenty, minutes. Its action is relatively evanescent and therefore, perhaps, more controllable; further injections are made at intervals of ten to forty minutes, as required. The dose depends on the preced-

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ing interval—after forty minutes a further 3 mg. will probably be necessary. A relaxant dose can be given for closing the peritoneum after laparotomy, with the assurance that adequate spontaneous respiration will be present by the time the operation has been completed.

Antidote.—Pentamethonium iodide, in a dose ten times that of decamethonium iodide, has proved an effective antidote.* It produces a powerful block of autonomic ganglia in animals. Like tetraethylammonium bromide, it may cause a fall of blood-pressure in man. We have found its use unnecessary in anæsthetic practice.

Respiratory System.—Thoracic and abdominal breathing fail, and recover, together. It has been noticed, in some cases, that the tone of the abdominal flank muscles persists as long as does respiration. In such cases it may, rarely, be necessary to paralyse respiration before sufficient relaxation can be secured for peritoneal closure. In two patients, neither of whom was intubated, a slight expiratory wheeze was detected. There is no reason to suppose that decamethonium iodide will have any effect on the production or prevention of bronchospasm. Davies and Lewis (1949), investigating the use of relaxants in electroconvulsive therapy, twice met with severe bronchospasm in one patient with *d*-tubocurarine, but this did not appear when decamethonium iodide was substituted. It has been used successfully in the management of intrathoracic operations with controlled respiration. It seems to act similarly to *d*-tubocurarine in reducing laryngeal muscular irritability and has proved effective in facilitating tracheal intubation, and, with thiopentone, for bronchoscopy and œsophagoscopy.

Cardiovascular System.—There appears to be no direct effect on the cardiovascular system, even with relatively large doses. It had been anticipated that, owing to the absence of any significant block of autonomic ganglia, traumatic shock might appear more often than with *d*-tubocurarine in severe operations under only a light screen of general anæsthesia. In practice it has been found that though, as expected, the blood-pressure has fluctuated more widely, the general level has been well maintained. Bleeding from cut surfaces is, perhaps, less than with *d*-tubocurarine.

Uterus.—Cæsarean sections have been undertaken with diffidence, since the relatively small molecule of decamethonium iodide might be expected to cross the placental barrier. With not more than 3 mg., injected intravenously at least ten minutes before delivery, with light nitrous oxide-ether anæsthesia, the results have been entirely satisfactory. The uterus has contracted well with the routine intra-uterine injection of ergometrine and pituitrin. Denny and Scurr (1949) have obtained satisfactory relaxation of the uterus for difficult external versions, using an injection of 3 mg. immediately after the induction of light nitrous oxide-ether anæsthesia. The patients recover consciousness within a few minutes. This may be an important discovery, since chloroform has hitherto been unequalled in such cases.

POSTOPERATIVE COURSE

Some patients who have rapidly recovered consciousness have complained of slight "giddiness," "lightheadedness," or headache.

Gastro-intestinal Complications.—Vomiting, usually slight, has occurred in well under 25% of patients in a series including a majority of major abdominal operations. There has been one case of ileus with peritonitis; abdominal distension is, otherwise, rather less than usual.

Respiratory Complications.—Postoperative collapse seems to be considerably less frequent than after *d*-tubocurarine chloride, though it is not yet possible to be certain of this. All of five patients who developed lobar collapse had respiratory paralysis during the course of operation; inadequate pulmonary ventilation may have been a contributory factor. All except one (herniorrhaphy) had a cuffed tracheal tube, and all had thiopentone and cyclopropane (Organe 1947).

Urinary Complications.—As many as 9% have had retention of urine for twenty-four hours, recovering spontaneously. The significance, if any, of this must await further investigation.

Cardiovascular Complications.—There have been no cardiovascular complications attributable to the anæsthetic. One patient, a woman aged 76, with severe jaundice, raised blood-pressure, and raised blood-urea, died during attempted pancreatectomy for carcinoma. At necropsy she was found to have a grossly damaged liver, coronary arteriosclerosis, atheroma, syphilitic aortitis, and emphysema. There seemed no reason to attribute her death directly to any of the anæsthetic agents.

ANÆSTHETIC AGENTS

All the common anæsthetic agents have been used, alone or in combination, with no obvious difference in effect. Provided the depth of anæsthesia is sufficient to prevent any obvious reaction to surgical trauma, the muscular relaxation produced by decamethonium iodide appears to be maximal. Inadequate relaxation is improved only at depths where the anæsthetic agent alone might be expected to produce a similar effect. In animals, ether appears to reduce the relaxant effect while increasing the tendency to respiratory paralysis.

A mixture of decamethonium iodide 4 mg. with thiopentone 1 g. has been used successfully. There seems to be no operation which could not be undertaken, if necessary, with this mixture, provided there is available some means of inflating the patient's lungs with air. The simplicity and portability of the necessary apparatus are attractive, particularly in such conditions as might be found on military service.

SUMMARY

Decamethonium iodide (C10) is a stable, neutral, non-irritant muscle relaxant, roughly five times as potent as *d*-tubocurarine chloride but having a shorter effect. It is marketed in solution containing 2 mg. in 1 ml. miscible with most injectable anæsthetics and adjuvants.

It produces a neuromuscular block which is not affected by anticholinesterases. Pentamethonium iodide is an effective antidote.

Limited experience of its use in anæsthesia suggests that it is a safe and effective substitute for *d*-tubocurarine chloride and free from undesirable side-effects.

The cases on which these impressions are based have been investigated by my colleagues and myself at the Westminster Hospital with the coöperation of the surgeons. Decamethonium iodide is marketed, in ampoules of a solution containing 2 mg. per ml., by Messrs. Allen and Hanburys ('Eulissin') and by Messrs. Burroughs Wellcome ('Syncurine'), who have supplied the drug for investigation by the anæsthetics committee.

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* Trials of pentamethonium iodide are in progress, under the auspices of the Medical Research Council, and a preliminary report will shortly be published.

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EFFECTS OF DECAMETHONIUM IODIDE (C10) ON RESPIRATION AND ON INDUCED CONVULSIONS IN MAN

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THE action of bistrimethylammonium decane diiodide (C10), now known as decamethonium iodide, in producing neuromuscular block in animals (Paton and Zaimis 1948) and its effect in a small number of human subjects (Organe, Paton, and Zaimis 1949) pointed to its clinical use for the same purposes as curare has served. It appeared from the preliminary studies that C10 had the advantage over curare that it spared the respiratory muscles. The investigation here reported (carried out by arrangement with the Medical Research Council) was concerned with collecting further evidence on this point and with determining whether C10 is suitable for reducing the force, and therefore the risks, of convulsions that are induced in the treatment of certain mental disorders.

COMPARISON OF C10 WITH *d*-TUBOCURARINE CHLORIDE

Method

Eighteen patients with a depressive illness were selected: all were judged likely to benefit from electrically induced convulsions, and all were free from physical disease. Their ages ranged from 19 to 59: there were seven men and eleven women. Each had a normal electrocardiogram.

They were given *d*-tubocurarine chloride (A) 15 mg. (1·5 ml.) intravenously on the first occasion, and C10 3½ mg. (3 ml.) intravenously on the second occasion three days later: thereafter the order of injection was C10, A, A, C10, C10, A, to preclude effects of suggestion. The patients arrived fasting, having received atropine sulphate gr. $^1/_{100}$ subcutaneously 45 minutes earlier, in order to lessen salivation during and after the fit. The injection of the C10 or the *d*-tubocurarine chloride took 15 seconds. After the effect of the first injection of C10 had been observed, the dose was varied, to produce an optimum modification of the fit, and one of the same degree as a given dose of *d*-tubocurarine chloride would effect in the same patient.

As the maximum paralysant effect of the drugs was manifested in the fourth minute from the start of the injection, the electrical stimulus was applied (from a MacPhail-Strauss machine) at the end of 4½ minutes. The quantity of electricity delivered was kept constant throughout the series of observations.

Before the injection, and during the 4 minutes in which the drug was acting before the electrical stimulation, continuous records were made of the recumbent patient's thoracic and abdominal movements. Two stethograph recorders were affixed, one around the upper chest and one around the abdomen, just below the umbilical level, and were connected with recording tambours, writing in coloured inks on white paper attached to a kymograph, electrically driven at 6 cm. per minute. At a later stage of the inquiry, the gaseous exchange of two of these patients was measured by a Kendrick spirometer. The minute volume of oxygen was determined after the patient had been at rest on a couch for 30 minutes: it was again determined in the third minute after injection of C10 or *d*-tubocurarine chloride.

In a further small series of observations, on six of these subjects, the patient, connected to the spirometer, was asked to breathe in as deeply as possible while resting: the same request was made at intervals of 2, 3, and 4 minutes after the injection of the dose of C10 or *d*-tubocurarine chloride which produced a modification of the induced fits rated + + + (see below). Between each of these estimations free breathing was allowed by unclipping the patient's nose and leaving the mouthpiece in situ while the valves were opened to the air.

Hand-strength was measured by a compressible dynamometer at half-minute intervals in several subjects, but the effort made by each patient on different occasions depended so much on emotional and other psychological factors that the findings were not a measure of muscular power and its impairment.

The extent to which the drugs modified each electrically induced convulsion was graded on a four-point scale. If the over-all violence of the fit was reduced, without abolishing flexion-extension movements of the spine, the modification was classified as 0; if spinal movements were abolished but arm movements unaffected, it was assessed as +; abolition of larger arm movements (flexion at elbow and adduction across chest) but with generalised clonus still evident, was assessed + +; much reduction, or total abolition, of visible clonic movements in trunk and limbs, was assessed as + + + modification.

The patients were asked to write down on the day after the treatment what they remembered of it and its aftermath.

Effects

Clinical.—The effects of C10 were not distinguishable by direct observation from those of *d*-tubocurarine chloride, either in respect of the pareses and paralyses induced or the characteristics of the modified convulsion. The eyelids, facial muscles, and neck muscles were early affected; the small muscles of the hand were demonstrably weakened before the larger muscles moving the proximal joints. Writhing movements of the arm were still possible after hand-grip had been lost. The voice became a whisper, and then inaudible; this was somewhat more readily effected by *d*-tubocurarine chloride than by an otherwise equivalent dose of C10. The bigger the dose of C10, the greater the paralysing effect. The largest dose given was 5·5 mg. C10. Patients differed from one another in the dose required to produce a severe effect, and this did not depend on their weight: 4 mg. of C10 produced a greater effect in a man weighing 173 lb. than the same dose in another man weighing 111 lb. Age and emotional causes, especially fear, seemed to be of some importance in determining the severity of response.

It was not possible, from the degree of weakness produced during the 4 minutes after the injection, to predict with confidence how great would be the modification of the induced convulsion, though as a rule there was close correspondence. Where the modification was maximal, nothing but a few clonic twitches around the eyes and a twitch of the platysma attested the occurrence of a convulsion: so complete a modification occurred only twice, and was not aimed at.

There were no untoward side-effects. Blood-pressure observations on three of the patients showed no effect from C10, except for the slight systolic rise occasioned by the venepuncture: it rose by approximately 20 mm. systolic and 10 mm. diastolic just after the convulsion, returning in 2–3 minutes to its pre-convulsion level.

All the patients recovered from the effects of the drug and of the induced convulsions sufficiently to walk from the room, with slight assistance, within half an hour after the injection.

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In their written accounts, no patient distinguished between the effect of the two drugs. Those who could remember events just before the convulsion described unpleasant sensations, loss of power in their limbs, and difficulty in breathing. For example:

"When I had the injection in my arm [3 mg. C10], my vision became rather blurred, then my eyes seemed to close automatically and I was unable to open them at all. Now I had to swallow rather hard to make my breathing come easier."

"Immediately after the injection [4 mg. C10] I felt a paralysing effect all over my body. Simultaneously I had tremendous difficulty in breathing—as never before in my life—and I thought I could not continue to breathe . . ."

Similar statements were made by the patients after *d*-tubocurarine chloride.

On Respiration.—For comparison of the effects of *d*-tubocurarine chloride and C10, it was necessary to use doses of each which were equipotent in producing motor weakness in any given subject. Since dynamometer readings proved unsatisfactory for the purpose in these subjects, the criterion of equipotence that was adopted was the extent to which an induced convulsion was modified by the drug: the four-point rating already described was used. Although cruder than reliable measurement of muscular power would have been, this was a consistent indicator of the general paralysant effect of a given dose, and in practice it was seldom difficult to rate the degree of modification. The rating had to be made separately for each subject, because of the variation in susceptibility from subject to subject.

The tracings obtained with a stethograph from the thorax and the abdomen showed no significant difference between the two drugs. Small doses of either produced thoracic movements of lesser amplitude, with slight increase in the rate but no change in the amplitude of abdominal movements. Larger doses abolished thoracic movement and diminished the amplitude of abdominal movements while greatly increasing their rate; sometimes paradoxical breathing developed, recognisable by the shape of the thoracic tracing as well as by the phase relationship. When abdominal movements were much affected by the drug, distress in breathing was apparent but cyanosis hardly ever developed, nor did these patients have any more respiratory disturbances during and after the electrical stimulation than other patients.

The minute/volume readings on the Kendrick spirometer showed that the respiratory exchange was adequately maintained (in those patients on whom the observations were made) by an increase in respiratory rate. This is illustrated by the readings in two male subjects shown in table I. The increase in minute/volume is in keeping with the observations reported by Finesinger (1939) after painful stimuli.

It is possible that those patients who complained of much respiratory distress would not have shown this compensatory mechanism: but only a few patients could coöperate sufficiently for these observations, and the patients with much subjective respiratory distress after C10 or *d*-tubocurarine chloride were not among them.

TABLE I—EFFECT OF C10 AND *d*-TUBOCURARINE CHLORIDE ON MINUTE RESPIRATORY VOLUME OF TWO PATIENTS

Subject	Date	Drug	Modification	Respiratory rate		Minute volume	
				Resting	In 3rd minute	Resting	In 3rd minute
A	March 1	*d*-tubocurarine chloride 20 mg.	+++	11/min.	18/min.	7200	7700
„	Feb. 24	C10 3 mg.	+++	11/min.	16/min.	6800	7700
B	Feb. 24	*d*-tubocurarine chloride 20 mg.	++	6/min.	14/min.	7200	9200
„	Feb. 22	C10 4 mg.	++	8/min.	14/min.	7200	9300

In the third group of respiratory observations, the maximal effect of which the diaphragm was capable was determined at various stages of increasing paresis; this provided evidence of the margin of respiratory safety afforded by both drugs. Maximum inspiration was chosen for the purpose, since it obviated the need to correct for the volume of carbon dioxide in the expired air. Correction was made for temperature but not for barometric pressure or water-vapour tension, since these could vary little during the 5 or 6 minutes which covered the period of recording. The findings are in table II. The reading is in each instance the one which, using equipotent doses, showed the maximal sparing of respiratory efficiency; this expedient was adopted to avoid as far as possible any fallacy due to the patient's not having made a maximal effort of inspiration.

The maximal inspiration after 4 minutes was greater when an equipotent dose of C10 had been injected than after *d*-tubocurarine chloride: the difference is statistically significant at the 3% level. If the decrement $M.I._0 - M.I._4$ is compared for the two drugs, the difference rises to the 0·2% level of significance. It seems, therefore, that *d*-tubocurarine chloride encroaches more on the reserves available in the diaphragm than C10 does in the equipotent doses used in this investigation: if this is correct, C10 offers a wider margin of safety.

GENERAL CLINICAL USE IN CONVULSANT THERAPY

Since several patients of the foregoing group complained of the unpleasant sensations produced by C10, as by *d*-tubocurarine chloride, it was administered to a larger series in combination with thiopentone sodium. One hundred and fifty administrations of C10 with thiopentone sodium have now been given, to forty patients, without any misadventure. The patients did not report any disagreeable recollections of the period between the injection and their awakening from the post-convulsive state.

TABLE II—EFFECT OF EQUIPOTENT DOSES OF C10 AND *d*-TUBOCURARINE CHLORIDE ON RESPIRATION

Subject	C10 (mg.)	$M.I._0$ (ml.)	$M.I._2$ (ml.)	$M.I._3$ (ml.)	$M.I._4$ (ml.)	*d*-tubocurarine (mg.)	$M.I._0$ (ml.)	$M.I._2$ (ml.)	$M.I._3$ (ml.)	$M.I._4$ (ml.)
C	2½	2180	1520	1500	1500	17½	2050	950	770	690
A	3	—	1770	1400	1210	20	3660	1500	1320	1170
D	2½	2190	1260	1010	970	15	2600	1130	920	820
E	2¼	1960	890	950	1000	12½	1650	520	300	240
F	2½	1770	1020	780	780	20	2350	500	450	300
G	3	3210	1370	1300	1210	15	3640	1680	1250	980

$M.I._0$ = Maximal inspiration before injection of drug. $M.I._2$, $M.I._3$, $M.I._4$, represent maximal inspiration at 2, 3, 4 minutes respectively after intravenous injection of the drug.

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The patient, who had been given atropine sulphate gr. $^1/_{100}$ 45 minutes in advance of the treatment, received an intravenous injection of thiopentone, 0·25 g. in 5 ml. solution, mixed with 3 mg. of C10 (3 ml.). The two drugs are freely miscible. A dose of 30 mg. of C5 (the antidote to C10) was kept loaded in a syringe during each treatment session but the need for its use did not arise.

The mixture of thiopentone and C10 was injected with the precautions advocated for all thiopentone injections by Macintosh and Heyworth (1943). The usual effect was immediate sleep. The patient's head was then turned to one side and his jaw held forward to prevent his tongue falling back. Just before the induction of the fit, $3^1/_2$ minutes after the injection (best measured by a stop-watch), the patient's head was restored to the middle position, and a rubber gag introduced between his teeth. No physical restraint of any kind was used, and no pillow put under the patient's back.

When the fit began, the rubber gag was removed and in its place a lubricated Guedel's airway of suitable size immediately introduced. If breathing was not satisfactorily restored spontaneously after the fit, controlled respiration was instituted, by means of a McKesson face-piece connected through a three-way valve to a rebreathing bag, which in turn was connected through a flowmeter to an oxygen cylinder. With the patient's head to one side, the face-piece was held firmly to the face in a gas-tight fitting by the employment of one hand, the little finger of which from behind the angle of the jaw maintained the jaw forward, leaving the other hand free to compress the bag. The breathing in such cases became satisfactory after a minute to a minute and a half, and the patient was then removed to the recovery room on the trolley on which the treatment had been given. The airway was not removed until the patient had regained control of his tongue. Most patients were able to walk out of the recovery room, with slight assistance, within half an hour.

The dose was determined after observing the effect of the first injection of 3 mg. of C10, with thiopentone. In some patients it could be lessened, in others it had to be increased, but never beyond 5 mg. It was in all patients possible to obtain a + + or + + + modification of the convulsion.

In those patients who had a physical disability which made it essential that the convulsion should be very much modified in order to avoid risk of damage, an initial dose of 4 mg. of C10 was given; the dose was subsequently reduced when it proved needlessly large. This procedure was followed with two patients, of whom one had an ankylosed elbow and the other a history of slipped cervical disc.

The advantages of C10 over *d*-tubocurarine chloride for general use in convulsant therapy would from this series of observations appear to be:

(1) It has no untoward effects. *d*-tubocurarine chloride produced severe and alarming bronchospasm in a patient on the two occasions on which it was given to him, but he had no such effect from C10 repeatedly administered, nor did any other patient develop this symptom after C10.

(2) C10 is readily miscible with thiopentone, whereas most preparations of curarine are not.

(3) It is simple to prepare, and cheap.

SUMMARY

The effects of moderate doses of C10 in man are clinically almost indistinguishable from those of *d*-tubocurarine chloride.

The effect of both drugs on respiratory movement, in the doses used for modifying therapeutic convulsions, is to lessen greatly and then abolish thoracic breathing, and later almost to abolish abdominal breathing movements.

Although the efficiency of respiration is impaired by both drugs in large doses, C10 spares the diaphragm more than does *d*-tubocurarine chloride.

C10 has been administered, with thiopentone, to a series of patients who were being treated by electrically induced convulsions, and has proved safe, effective for this purpose, and without disagreeable side-effects.

We are indebted to Mr. P. Chappell and his assistant, Mr. E. L. Parrish, for valuable technical help in making the records of respiration, to Mr. A. R. Jonkheere for statistical advice, and to Dr. Geoffrey Organe for his assistance. Thanks are due to Burroughs Wellcome & Co. and Allen & Hanbury's Ltd. for supplies of C10.

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HANDKERCHIEFS IN THE TRANSFER OF RESPIRATORY INFECTION*

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Hamburger and his co-workers have shown that large numbers of hæmolytic streptococci may be recovered from the handkerchiefs of some carriers of these organisms (Hamburger and Green 1946), and attention has been drawn to the numbers of bacteria-carrying particles which may be dispersed during the natural manipulation of a dry, used handkerchief. The nature of these particles appears to protect the contained bacteria from the action of aerial disinfectants (Dumbell et al. 1948). Since used handkerchiefs contain various quantities of nasal secretion, sputum, and sneeze droplets they are an obvious source of danger in the transfer of respiratory disease. An efficient method for the rapid destruction of pathogens deposited on the handkerchief would facilitate experiments designed to determine the relative importance of this vehicle in the transfer of different respiratory infections. If sufficiently simple and effective, such a method might even find a place in the control of respiratory disease.

This raises the question of the criteria by which a disinfectant treatment for handkerchiefs is to be judged and which should guide the search for a suitable method. The desiderata for a satisfactory disinfectant are:

(1) It must be efficient under the particular conditions imposed on its action.

(2) It must be active against a wide range of pathogenic bacteria and, if possible, viruses.

(3) It must have no objectionable odour or taste.

(4) It must be non-toxic in all reasonable concentrations, both locally and systemically.

(5) It must be easy to apply.

(6) A treated handkerchief must retain its activity during considerable periods of storage.

(7) The cost of the treatment must not be prohibitive.

(8) A treatment which survived several launderings would be desirable though not essential.

Suitable textile disinfectants have been found in cetrimide (cetyltrimethylammonium bromide, or C.T.A.B.) and cetylpyridinium bromide (C.P.B.) (Rountree 1947). These, like other cationic detergents, have the drawback that some people are sensitive to local applications: about 5% of the population are sensitive to cetrimide, and less than 1% to C.P.B. (Williams et al. 1943). They would therefore be unsuitable for use with handkerchiefs. An alternative to disinfection is to prevent bacteria-laden dust from leaving the handkerchief. Dust-suppressive measures have been very successful, particularly in the treatment of bed-clothes (Van den Ende et al. 1941).

* A previous article on this subject by K. R. Dumbell, J. E. Lovelock, and E. J. Lowbury appeared in THE LANCET of July 31, 1948.

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We report here our laboratory findings with some of the newer disinfectants. The substances we tested were 5-aminoacridine, cetylpyridinium bromide, phenylmercuric acetate, phenylmercuric bromide, hexyl resorcinol, and octyl cresol. Medicinal paraffin, a dust-laying agent, was included for purposes of comparison.

PRELIMINARY SORTING OF A RANGE OF DISINFECTANTS

Method

Pieces of cotton about 8 in. square were impregnated by immersion in a solution of the disinfectant to be tested. After soaking for 30 min. in a solution of suitable concentration the squares were lifted out and allowed to drain and dry. The quantity of disinfectant deposited was measured

TABLE I—NUMBERS OF *Staph. aureus* COLONIES FROM SHAKING TREATED INOCULATED COTTON SQUARES EXPRESSED AS AVERAGE % OF COUNTS FROM UNTREATED CONTROL SQUARES

Substance	Concentration of disinfectant in textile (mg. per g.)					
	22	11	3·3	1·1	0·33	0·11
C.P.B.	1·0	13·5	85	76	100	..
5-Aminoacridine	50	85	75	100	..	..
Phenylmercuric acetate	..	1·5	16	22	29	37
Phenylmercuric bromide	..	5	8	11	..	..
Hexyl resorcinol	0·2	1·0	3·6	100	..	..
Octyl cresol	0·5	2·6	50	100	..	..
"Alkyl" resorcinol*	0·5	..	..	..	..	..
Medicinal paraffin	25	..	..	..	..	..

* See text.

by noting the volume of fluid absorbed by the handkerchief and confirmed by chemical estimations of the disinfectant content of the dried treated square. The squares when dry were inoculated with the test organism, *Staphylococcus aureus*, suspended in normal human saliva to simulate natural conditions as closely as possible; 1 ml. of this inoculum was placed, as drops, in a 10 cm. circle marked in the central portion of each square. The squares were allowed to dry and remain over night at room temperature (70°F). Next day they were shaken over nutrient-agar plates in a modification of the apparatus described by Schechmeister and Greenspan (1947). An agar plate was exposed on top of a metal cylinder and surrounded by an open ring 3 cm. high and 12 cm. in diameter. A cotton square was laid over the top of this ring and maintained at standard tension by a 200 g. weight clipped to each corner. The square was shaken by dropping on to it a 50 g. ball from a height of 50 cm.; 3 min. was allowed for settling, and then the agar plate was removed and incubated. A colony count was made after twenty-four hours, when the staphylococcal colonies could be readily distinguished. As controls, untreated squares were inoculated and shaken by the same technique.

Reasonably consistent counts were obtained, and the unit of observation was taken as the average count from five separate squares which had undergone the same treatment.

Various methods were used to prevent inhibition by small quantities of disinfectant shaken on to the plate with the bacteria. Squares treated with phenylmercuric acetate and phenylmercuric bromide were sampled on to agar plates containing 0·1% sodium thioglycollate. Hexyl resorcinol and octyl cresol were removed from the cotton squares before shaking by extracting them in low-boiling (40–60°C) petroleum ether in a soxhlet apparatus. Check experiments showed that this treatment did not of itself reduce the counts obtained from control squares; nor did it, by raising the temperature, accelerate the activity of low concentrations of disinfectant so as to render them apparently more efficient.

At this stage of the investigation it was realised that such precautions were not always necessary. Cotton squares were inoculated with saliva containing fluorescein and shaken over a petri dish containing fluid. By titration of the fluorescein removed it was found that less than 5×10^{-8} g. was being shaken off. Even if all the disinfectant in the square were dissolved into the 1 ml. of inoculum, the quantity removed on shaking would be insufficient to produce inhibition in the plate. It was in fact found that identical counts were obtained whether or not the precautions mentioned above were taken; and for C.P.B. and 5-aminoacridine, where the inhibiting concentrations for *Staph. aureus* are higher than that of phenylmercuric acetate, no precautions were taken to prevent possible inhibiting action. Octyl cresol was, however, rather a special case; its action (see below) is in part disinfectant and in part dust-laying, and this latter action was prevented when the substance was extracted.

Results

Table I summarises the results. All the substances tested except 5-aminoacridine were very effective, and were considerably more so than medicinal paraffin. Hexyl resorcinol in particular stands out as being apparently the most effective, and it is closely followed by octyl cresol and "alkyl" resorcinol. "Alkyl" resorcinol denotes the reaction product of tertiary butyl alcohol and resorcinol (see below).

RAPIDITY OF ACTION

The next step was to try to measure the rapidity of killing by the four most efficient substances mentioned in table I.

Cotton squares were impregnated and inoculated as described above. Small circles 1 cm. in diameter were cut out after 5, 30, and 120 min., and 10 ml. of physiological saline solution was drawn slowly through them with a filter pump. Aliquots of the washing were then plated on nutrient agar and incubated for twenty-four hours. The volume of the washing fluid was calculated so that the greatest possible concentration of any of the disinfectants therein should be less than its inhibiting concentration against *Staph. aureus*.

Table II shows the results.

The findings in these first two experiments led us to concentrate attention on the resorcinols and octyl cresol. The next step was to assess the range of activity of these three substances against selected bacteria and viruses. They show a somewhat selective action against gram-positive bacteria though not so much as does cetylpyridinium bromide. Their actions were compared in suitable concentrations against *Staph. aureus*, *Strep. hæmolyticus*, and *Bact. coli*. Table III shows the results.

Hexyl resorcinol and octyl cresol were shown to be virucidal against dermal vaccinia and influenza-A viruses, both in the test-tube and on cotton fabric.

TESTING OF HANDKERCHIEF TREATMENTS UNDER FIELD CONDITIONS

It is hoped that there will be an opportunity to test the more satisfactory of these disinfectants on handkerchiefs used by persons with various respiratory infections. As a preliminary to this the treatments have been tried on handkerchiefs issued to volunteers for the common-cold research programme. The method of issue and technique of shaking have been described (Dumbell et al. 1948) for untreated handkerchiefs. For the present purpose handkerchiefs were issued for periods of twenty-four hours. Controls were provided by issuing untreated

TABLE II—RAPIDITY OF ACTION OF VARIOUS TREATMENTS AGAINST *Staph. aureus*

Treatment	Concentration of disinfectant (mg./g.)	Time between inoculation and extraction (min.)		
		5	30	120
None	..	+ + +	+ + +	+ + +
C.P.B.	22	+	+	+
Phenylmercuric bromide	11	+ + +	+ + +	+
Hexyl resorcinol	22	+ +	+	−
Octyl cresol	22	+ + +	+ +	−
"Alkyl" resorcinol	22	+ + +	+	+

+ + + = > 1000 Average number colonies per inoculum.
+ + = 300–800 " " " " "
+ = 20–200 " " " " "
− = 0–10 " " " " "

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handkerchiefs to the same persons for the two periods of twenty-four hours immediately preceding and following the issue of treated handkerchiefs. Table IV shows the results obtained with phenylmercuric bromide, hexyl resorcinol, octyl cresol, alkyl resorcinol, cetylpyridinium bromide, and medicinal paraffin.

It is notable that the disinfectant action of the various substances tested bears little or no relationship to their phenol coefficients. Thus hexyl resorcinol is much more effective than phenylmercuric acetate in rendering a handkerchief self-sterilising, though their phenol coefficients against *Staph. aureus* are 164 and 2259 respectively (Birkhaug 1933).

The basis of the disinfection process on textiles is likely to be that sufficient disinfectant to sterilise must diffuse from the textile into the secretion before the latter has dried and diffusion all but ceased. This diffusion process will be favoured by a high solubility of the disinfectant in the secretion, a large area of contact between the disinfectant and the secretion, and any process favouring the retention of water by the secretion. The best effect is to be expected from a compound having not only a high phenol coefficient but also adequate solubility in nasal and oral secretion, a high degree of surface activity, and low molecular weight.

Treatment with a dust-laying agent—i.e., medicinal paraffin—was much less efficient than disinfectant treatment under the test conditions, which involved the deposition of a relatively heavy load of wet secretion on

TABLE III—REDUCTION OF "SHAKING COUNT" OF VARIOUS ORGANISMS BY PHENOLIC DISINFECTANTS. (FIGURES EXPRESSED AS % OF CONTROL COUNTS.)

Substance	Concentration (mg./g.)	Test organism		
		Staph. aureus	*Strep. pyogenes*	*Bact. coli comm.*
Hexyl resorcinol ..	22	0·2	0	4
Octyl cresol ..	22	0·5	0·1	23
"Alkyl" resorcinol	22	0·5	0	4

to the dry handkerchief. The oiling of textiles is well known to be efficient in laying dust applied in the dry state, but might easily fail to prevent the redispersion as dry dust of a secretion applied wet to the oiled fabric. This point is at present being investigated. The liquid disinfectant octyl cresol appears to act both as a dust-layer and as a disinfectant. These two properties were studied by comparing the dispersion of micro-organisms before and after treatment of the cotton fabric with petroleum ether to extract the octyl cresol. The average from two parallel groups was disinfection alone 8%, dust-laying alone 6%, disinfection and dust-laying combined 0·5%, the figures being expressed in terms of the dispersion from cotton squares not treated with octyl cresol. This dual action may considerably enhance the value of octyl cresol as an agent for dust-laying on textiles.

FACTORS AFFECTING PRACTICAL USE

The experiments described hitherto have shown that, of the substances tested, octyl cresol and the resorcinols were the most effective in rendering handkerchiefs self-sterilising.

If the large-scale use of handkerchiefs treated with one of these compounds would lead to a reduction of the transfer of respiratory infection, the following problems affecting the practical use of treated handkerchiefs must be considered.

Systemic and Local Toxicity.—The quantities of hexyl resorcinol and octyl cresol applied to the normal 18 in. square handkerchief in the treatment methods described above

TABLE IV—REDUCTION OF TOTAL "SHAKING COUNT" OF NATURALLY USED HANDKERCHIEFS

Substance	Concentration (mg./g.)	Survivors (%)
C.P.B.	11	22
Phenylmercuric bromide ..	11	15
Hexyl resorcinol	22	3·0
Octyl cresol	22	14
Octyl cresol	11	39
"Alkyl" resorcinol	22	10
Medicinal paraffin	22	28

—i.e., 400 mg.—are such that little or no harm should result if a person were so misguided as to swallow the whole of a treated handkerchief. The recognised daily dose of hexyl resorcinol as an anthelmintic is 360–1800 mg., whereas octyl cresol fed to rats is tolerated in doses as high as 3 g. per kg. of body-weight. There is no suggestion that skin reactions would develop from the slight contact with these substances on treated handkerchiefs.

Subjective Effects, including Odour and Appearance.—Handkerchiefs treated with hexyl resorcinol cannot be distinguished by sight, smell, or feel from those not treated. Octyl cresol has no effect on the appearance or feel, but a slight, not unpleasant, odour is imparted to the handkerchief. This odour is due to slight traces of hydrocarbon impurities present in commercial octyl cresol. If the odour is found objectionable, it should be relatively simple to purify the octyl cresol before application without unduly increasing the cost of treating the handkerchief.

Application and Persistence of Treatment.—The exact details of the best methods of applying these compounds to textiles are beyond the scope of this paper. It can be said, however, that the addition of a watery emulsion of the disinfectant to the last rinsing water during laundering is the method most likely to be used in practice. This technique has been developed for the application of technical white oil to textiles (Harwood et al. 1944). The treatment would have to be repeated at each washing, since both octyl cresol and hexyl resorcinol are dispersed by soapy water. The volatility of both of these compounds is sufficiently low to ensure the persistence of the disinfectant on the handkerchiefs for at least two weeks, provided they are not heated unduly during this period.

Cost and Availability.—Hexyl resorcinol is at present very expensive and, in view of the nature of its preparation, is likely to remain so even in the event of a considerable demand. Octyl cresol, on the other hand, is remarkably cheap and readily obtainable in quantity. The cost of disinfectant required for one treatment of a handkerchief at present prices is 5*d.* for hexyl resorcinol and 0·03*d.* for octyl cresol.

ALKYL RESORCINOL

The outstanding results obtained with hexyl resorcinol and the two disadvantages of octyl cresol—its odour and selective disinfectant action—suggested that the use of other alkyl resorcinols cheaper to make than hexyl resorcinol was worth exploring. For example, the reaction between two molecular equivalents of tertiary butyl alcohol and one of resorcinol in 50% sulphuric acid at 60°C. gives in excellent yield a mixture of alkyl resorcinols. This mixture, referred to above as "alkyl" resorcinol, was bacteriologically efficient (tables I–IV) and was free from odour or other objectionable properties. Because of the uncertainty of its composition this mixture cannot be recommended for use without further investigation into its composition, but its preparation has shown that alternative alkyl resorcinols can be made readily by simple methods. Very probably some alkyl resorcinols will have most of the desirable properties of hexyl resorcinol and yet be cheap to prepare.

DISCUSSION

The treated handkerchief, as a measure of preventive medicine, is likely to succeed only in those diseases spread predominantly by nasal secretion, in particular those

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diseases in which the causal agent can survive the time and action of drying. The nasal carrier of hæmolytic streptococci has been shown by Hamburger and Green (1946) to contaminate textiles in such a manner as to render them prolific sources of infected dust. Unpublished work of the Common Cold Research Unit has shown that the handkerchief collects more than 70% of nasal secretion. It may therefore be predicted with some confidence that the treated handkerchief should, if used by the nasal carrier of these organisms, reduce the environmental contamination even if not the incidence of infection.

The extent to which respiratory-tract infections are spread by contact either direct or through fomites is unknown; but, if they are so spread, the handkerchief often acts as intermediary between the nose and fingers. There are evident possibilities for the use of treated handkerchiefs as chain-breakers in the succession of events involved in the transfer of nasal secretion by contact.

The potential importance of the handkerchief in the spread of infection, and the promise shown by the methods of disinfectant treatment described, suggest that a trial of these methods in the prevention of some suitable infection is worth while.

SUMMARY

Several disinfectants have been tested for their ability to sterilise nasal secretion as it is deposited in the handkerchief.

The most efficient of the disinfectants tested was hexyl resorcinol but there was evidence that other alkyl resorcinols might be equally effective.

Disinfection with hexyl resorcinol was much more effective than dust-laying agents in preventing the dispersal of micro-organisms from a handkerchief.

We wish to acknowledge our indebtedness to the competent technical assistance of Miss J. Betteridge and Mr. S. Osborne.

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"... Another important aspect of a patient is his behaviour in and towards his group. What sort of relationship does he develop towards his bed-neighbours and towards the ward in general? This can only be learned by informal visits to the ward when it is at its ease, e.g. the evening smoking-hour, when student or houseman can wander round unaccompanied by sister, chatting with individuals and groups. It is also an opportunity for assessing—and raising—the morale of the ward. . . . Nor must we forget the patient's relationship towards his wife and family and his other social ties. These can only be glimpsed by cultivating the relatives during visiting hours. Traditionally, I remember, these used to be hours when any houseman with any sense normally took very good care to be inaccessible. Why? Could it have been because we were afraid of relatives with their questions which we didn't know how to answer or evade? I'm afraid it was; and so we delayed the epoch-making discovery that relatives like to be questioned. It gives them a sense of active participation in the drama; and if questioned hard enough, they themselves confine their questions to simple ones and are satisfied with simple answers. More than half of general practice consists of the skilful treatment of relatives: why on earth did we not gain experience in this field at a time when mistakes were not so costly as they were later?"—"PETER QUINCE," *Brit. med. Students' J.*, Spring, 1949.

IS INSULIN ANTIGENIC?

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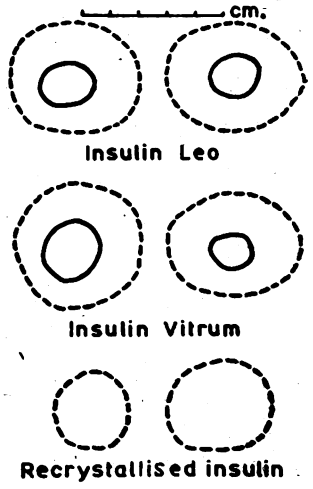
THE capacity or incapacity of insulin to give rise to allergic reactions is a question of both theoretical and practical interest. As a hormone which occurs throughout the range of vertebrates, it might be considered non-antigenic. Often, however, it causes allergic reactions in diabetics—mostly local symptoms at the sites of injection, but sometimes also generalised reactions. These might be attributable to impurities in the insulin, since they decrease in number and severity with increasing purity of the insulin. They may, however, appear even after the administration of crystalline insulin.

It has been found (Jorpes 1949a and b) that diabetics who exhibit allergic reactions to insulin readily tolerate recrystallised samples of insulin; but several recrystallisations are sometimes necessary. In 1941 one of us (E. J.) observed that a young diabetic, who could not use any of the commercial brands of insulin, including a "crystalline" insulin, readily tolerated an insulin recrystallised four times, which was originally intended for chemical analysis and therefore carefully purified (Malmström 1941). Since then patients in Sweden complaining of local or generalised reactions from insulin have been supplied with recrystallised insulin by the Swedish manufacturers of insulin (Vitrum, Stockholm). About 300 patients have asked for the purified insulin. Their hypersensitiveness was not controlled by any immunity tests, but the requests were made through their doctors. In not a single case did the purified insulin fail, but the most sensitive patients asked for an insulin which had been carefully recrystallised up to seven times. Frequent controls were made by supplying them with less pure insulins.



Intradermal injection of 4 units of two commercial brands of insulin (Leo and Vitrum) and of an insulin recrystallised five times before (left) and after (right) the insulin treatment.

It was observed that after a time most of these patients no longer needed the purified insulin, their hypersensitiveness having gradually disappeared. After a period varying from some months to a year they could take ordinary insulin. Usually no more was heard of them. Even some of the patients with the most troublesome local allergic reactions could, after one or two years, use an amorphous insulin containing 16–17 units per mg. Not all the patients, however, exhibited so favourable a course. There remained about twenty who continued to require insulin recrystallised three to five times.

Since the local reactions, which disappeared when the purified insulin was used, clearly indicated a sensitiveness to the ordinary insulin, no allergy tests were made in this series.

Only on one patient was the usual skin test made, and this case is described here.

CASE-REPORT

A woman, aged 40, who had developed asthma at the age of 2 years, after measles, reacted very strongly to wheat extract at a skin test made in 1941. She had noticed this oversensitiveness herself, and her asthma had been worse when she was living near a large bakery.

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After the skin test she had undergone a course of specific desensitising treatments with wheat extract, and in conjunction with these she had also received sulphur injections as a non-specific desensitising treatment. Since her asthma persisted, she received courses of sulphur injections in 1942 and in 1944.

During a protracted stay in hospital in 1946–47 for asthma with fever and vague rheumatic symptoms, ordinary insulin was given to overcome mental depression, from which the patient had been suffering for some time. This treatment had to be interrupted after three days, because the patient had a severe asthmatic attack and allergic rhinitis about half an hour after the injection of insulin. During these three days the patient had only had one dose of insulin (4 units) each day. At the site of these injections there appeared an erythema about 30 × 30 mm. in size. Over this area a troublesome sensation of heat and irritation was experienced the whole day following the injection.

When the patient was recently in hospital again, chiefly for her mental depression, cutaneous tests were made with ordinary insulin (Vitrum and Leo) and an insulin recrystallised five times. After an intracutaneous injection of 0·1 ml. of undiluted insulin (4 units) an infiltrated area roughly 20 × 20 mm. with its surrounding halo was observed at the site of injection of the non-purified insulins after 20 min. At the site of injection of the recrystallised insulin no infiltration appeared, and there was only a small area of redness (see figure).

A course of treatment with the recrystallised insulin was then instituted. The initial dose was 4 units. After that one injection a day was given, the amount of insulin being gradually increased to 32 units.

During this course of insulin there was no particular discomfort from allergic rhinitis; nor were there any local reactions at the site of injection of the recrystallised insulin. At the physical examination of the lungs, both before the start of the insulin treatment and while it was in progress, small sibilant dry râles were heard all over the pulmonary fields when the breath was forcibly expelled. It was only for a few days, in association with her menstrual periods, and on several occasions when she had received analgesics containing opiates because of severe attacks of myalgia, that she suffered from her asthma, and at the same time more massive râles were heard over the pulmonary fields.

When the insulin treatment was terminated after about forty injections, another skin test similar to that made before the beginning of the treatment was made with different kinds of insulin. The result was almost exactly the same as before—i.e., after the recrystallised insulin there was only a reddened area without signs of infiltration, whereas after the two non-purified insulins there was a definitely palpable infiltration.

DISCUSSION

The practical consequence of these findings is that desensitisation is probably superfluous in cases of insulin allergy. Thoroughly purified insulin seems to be tolerated by all diabetics. Various recrystallisations of insulin may be tried, and protamine-zinc insulin may be prepared from the purified insulin.

In practice the problem is simplified, since most of the patients showing mild local reactions to insulin at the sites of injection lose their sensitivity after continuing the use of insulin for several weeks. No unnecessarily hasty steps should therefore be taken. Most of the 300 patients who temporarily received recrystallised insulin in Sweden in 1941–47 could resume the use of commercial insulin.

If the symptoms become troublesome and persist, a recrystallised insulin may be tried for a time. After one or two months a commercial brand of insulin should again be tried. If the symptoms persist, a search should be made to find a suitable recrystallised insulin.

Thus, though the difficulties arising as the result of allergic reactions in insulin therapy can be obviated by using recrystallised insulin, the question whether or not the insulin protein itself is an antigen is not so easy to answer. It is conceivable that a few extremely hypersensitive persons might become sensitised to the insulin protein.

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Reviews of Books

Surgery, Orthodox and Heterodox

Sir HENEAGE OGILVIE, K.B.E., D.M., M.CH. Oxfd, F.R.C.S., surgeon to Guy's Hospital. Oxford: Blackwell Scientific Publications. 1948. Pp. 241. 12*s.* 6*d.*

IN this book Sir Heneage Ogilvie has republished a number of articles which he has contributed to medical journals over a considerable period of years. Many of them are philosophical ruminations on the aims of surgery, the manner in which its problems should be approached and their possibility of fulfilment. Writing of orthodoxy and heterodoxy in surgery he speaks of operations devised and adopted in good faith but given up because "the reasoning on which they were based having proved to be unsound, they have left no progeny." There is always a danger, however, that a bad operation which has been discarded may be revived simply because it has been forgotten too well. He keeps a file, a "Chamber of Horrors," in which such revivals are recorded, as well as methods which reintroduce faults carefully defined and warned against by the great pioneers. Such mistakes are the penalty (paid by the patient) for the surgeon's insufficient reading. Sir Heneage compares progress in surgery with the progress of a barge up the Thames; "the advance of knowledge must be wayward: the locks are periods of orthodoxy; the advances of heterodoxy." The book is memorable not only for apt metaphors of the kind, but because it records the ingenuities of a great craftsman.

An Introduction to Cardiology

GEOFFREY BOURNE, M.D., F.R.C.P., physician-in-charge of the cardiological department, St. Bartholomew's Hospital, London. London: Edward Arnold. 1949. Pp. 264. 18*s.*

A LIVELY entertaining style characterises Dr. Bourne's book, and his apt similes will arrest the student's attention. Some passages are not as clear as they might be, and there are some unorthodox statements. Thus left-sided failure is not usually a result of mitral stenosis; the pulse is often slow and not rapid in the early hours after coronary thrombosis; digitalis in large doses is not the best remedy in ventricular tachycardia; the most important element in the treatment of agranulocytosis—namely penicillin—is not mentioned; and to say that coronary pain may occur without much evidence of myocardial failure is to distort the relation between the two symptoms. The description of the position of chest leads could be clearer. But there is a good selection of clear cardiograms, and space is well apportioned.

Practical Therapeutics

M. E. REHFUSS, M.D., F.A.C.P., professor of clinical medicine, Jefferson Medical College; F. K. ALBRECHT, M.D., co-director, division of tuberculosis control, Kansas State department of health; A. H. PRICE, M.D., assistant professor of medicine in the college. London: Baillière, Tindall, and Cox. 1948. Pp. 825. 82*s.* 6*d.*

THE authors of this large volume have tabulated treatment much as a painstaking student might tabulate his notes of a series of lectures for later revision and reference. Indeed the book is based on the work of students who were set particular problems of therapeutics to investigate in detail; and their contributions, after revision and editing by the 13 joint authors, make up the bulk of the subject matter. The result is a full and complete account of practical therapeutics divided into four sections—the first on general therapeutic principles, the second on symptomatic treatment, and the third on specific disorders taken system by system. The last section covers a number of special treatments—ophthalmic, psychological, physical, occupational and others—including quite a full account of radioactive isotopes. The authors, intent on providing a really complete manual, give the fullest detail, and are even at times almost too elementary; but this makes a welcome change from the loose and indefinite instructions given by most writers on therapeutics. Whether they are concerned with prescribing, or methods of practical treatment such as intravenous therapy, physical methods, and the like,

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their information is precise. In each section they briefly review diagnosis and ætiology (where appropriate), but never in any detail. Their classified lists and tables, and their brief direct instructions, are supported by a number of somewhat fanciful diagrams and a fully adequate index.

Anæsthetics and the Patient

GORDON OSTLERE, M.B., D.A. London: Sigma Books. 1949. Pp. 163. 7s. 6d.

THE author is more modest than his publishers, who assure the prospective reader that this book explains "exactly how anæsthetics work." The text is comprehensive, light, amusing, and accurate, but of doubtful value to the non-medical public for whom it is avowedly written, and not substantial enough for the candidate for a diploma in anæsthetics. Snow's *On Chloroform and other Anæsthetics* published in 1858 was hardly the first book on this specialty, as Dr. Ostlere implies, for it was preceded in 1847 by the classic *Ether* by the same author.

The Scientific Paper

SAM F. TRELEASE, Columbia University. Baltimore: Williams & Wilkins. London: Baillière, Tindall, and Cox. Pp. 152. 11s.

MOST scientific workers enjoy the search, whether it be through experiment or observation of nature; relatively few enjoy the inevitable writing up (though judging from the modern spate of scientific "literature" still fewer are so self-effacing that they will not take the necessary steps). This little manual has been written to help them. In certain ways, particularly technical ways, it may well do so. For instance its reader is given advice on how to set about as well as set out his manuscript, how to draw up his tables and prepare his diagrams, how to turn up his references in the library and quote published work. He will learn of the kinds of type that printers use, how to convey succinctly and clearly to the printer what he, the author, wants done, how to correct his proofs, and so on. But how to write the paper at all is quite another matter, and that is where most of us fall so lamentably short. "Present the material in a manner that will enable the reader to grasp it as quickly and easily as possible." "Achieve completeness and clarity without sacrificing conciseness"—an injunction which some may feel is concise without being either complete or clear. "Aim, where possible, to explain facts in the symbols or language of mathematics and according to the laws of physics and chemistry." Omit "tedious details," precede "every dull passage by a stimulating introduction," use "colorful words and vigorous turns of expression"; in fact, lead "the reader to feel that he is doing his own thinking—not merely following; stimulating his imagination and giving him a sense of achievement." Sound, even impeccable, advice; but if we knew how to follow it, should we want this little book?

Technic of Medication

AUSTIN SMITH, M.D., director, division of therapy and research; secretary, council on pharmacy and chemistry, American Medical Association. Philadelphia and London: J. B. Lippincott. 1948. Pp. 255. 30s.

WHILE attending a lecture course in pharmacology the medical student is expected to acquire an appreciation of the scientific principles of the subject and their therapeutic applications. Success in this enterprise, as judged by the student's capacity to satisfy the examiners, still leaves many lacunæ in his knowledge of matters important to the general practitioner. Such topics include isotonicity in relation to eye lotions, the preparation of a starch poultice and the indications for its use, and how to dispense unpalatable medicines. Dr. Austin Smith's book is designed to supply these deficiencies. Most of the space is devoted to a conventional presentation of modes of administration of drugs—a subject apt to receive scant attention in the medical curriculum. There is also a useful chapter on general considerations in medication, and another on prescription writing. Under the title of "Some Practical Aids" there is a miscellany of information not readily available elsewhere—such as notes on the hospital pharmacy, telephone prescriptions, and professional relations. The author recommends phenobarbital "for an additive effect when acetyl salicylic acid is insufficient to permit sleep by relieving pain," but in practice this is likely to give disappointing results. The book is written in the simplest terms and few details are overlooked. It is a worthy descendant of *General Technic of Medication* by the late Bernard Fantus, and will be valued by the house-physician and the senior student.

Your Hospital—Heritage and Future

A. R. J. WISE, F.H.A., general superintendent, Saint Mary's Hospitals, Manchester. London: Heinemann Medical Books. 1949. Pp. 239. 15s.

THE great army of those who are in some way associated with the hospitals—by no means all of them medically qualified—deserve much better literature than is at present available to them. It is not easy to write about hospital work as a whole; all sorts of difficulties present themselves. The subject is large and various, and changes as the writer moves from one standpoint to another. "I believe," says Mr. Wise, "that the sectional preoccupation of those concerned with one phase or another of hospital work sometimes obscures a picture which needs to be seen steadily and whole. And I have had in mind the fact that for the general public science is becoming 'popular,' creating a need for a responsible literature dealing in plain terms with what is in every sense their own concern."

The book, resulting from this approach, is well arranged and interestingly written in a semi-popular style well suited to its purpose. Much of it is descriptive, and many of the special and other departments of a hospital, as well as nursing, catering, and hospital design, are dealt with in turn. There is a readable and well-proportioned account of the stages which led to the National Health Service, though a section dealing with the earlier history of the hospitals appears to have been hastily written. The book contains a great deal likely to be of interest to the inquiring minds of those connected with hospitals who are unable to see the wood for the trees.

Éclampsie et éclampsisme

HENRI VIGNES. Paris: Masson. 1948. Pp. 220. Fr. 450.

THE author has presented a careful and exhaustive clinical and pathological review of eclampsia, thoroughly surveying every aspect of the disease. He draws on a vast bibliography in his determination to give every theory a hearing, but no new or startling facts are disclosed. The book shows that current French practice in the treatment of eclampsia is in step with our own. There are no illustrations, except for a few graphs, which are not easy to follow.

Dictionnaire des termes techniques de médecine (15th ed. Paris: Maloine. 1949. Pp. 1038).—This useful dictionary of French medical terms, giving, where applicable, their derivations from the Greek, has reached its fifteenth edition. It is compiled by Prof. M. Garnier and Dr. V. Delamare.

Atlas der Augenkrankheiten (5th ed. Stuttgart: Thieme. 1948. Pp. 225. D.M. 60.).—This atlas of eye diseases, by Prof. Rudolf Thiel, of Frankfort-on-Main, first appeared in 1936. It was a useful volume bringing together in colour plates, monochrome illustrations, and line drawings, a mass of clinical, pathological, and operative detail. The book evidently proved successful: three editions were called for during the war, and the present edition appeared last year. But a perusal leaves the reader sadly wondering what has happened to German ophthalmology. The new illustrations either show non-existent clinical entities, or else give such a distorted view of new work as to be misleading. Only a romantic revival in German ophthalmology, parallel to the romantic movement German medicine experienced at the beginning of the 19th century, could explain the figures illustrating acute conjunctivitis caused by hæmolytic streptococci, or the illustration of epidemic keratoconjunctivitis. The therapeutics of the volume can be assessed by the advice to use mercury cyanide, potassium, permanganate, and heat in the treatment of ophthalmia neonatorum. Penicillin is mentioned in the treatment of orbital cellulitis, and the dose advocated is 3-hourly injections of 10,000–20,000 units; alternatively it is to be given by mouth.

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THE LANCET

LONDON: SATURDAY, MAY 7, 1949

Senior Hospital Medical Officers

IN advising on the remuneration of consultants and specialists, the Spens Committee took care to review the situation of the specialist in training, and it proposed new and better standards of pay for housemen and registrars preparing themselves to hold specialist appointments later. To those responsible for the report and its acceptance, and especially to Lord MORAN, the profession will long have reason to be grateful; they faced the difficulties squarely, and were not afraid of innovation. In retrospect, however, it seems that on one point their guidance might have been more precise; and this point is now seen to be important. In tracing the evolution of the specialist from larva to imago, the committee did not discuss the position of men whose transformation is delayed, or ceases, before they acquire full specialist status. It dealt faithfully with specialists, and with specialists in training; but in so doing it seemed to assume that everyone trained for specialised work, and performing it in the hospital service, could claim to be a specialist. If such a man was not a specialist (the reader might ask), what was he? Obviously he was not a general practitioner; he could not indefinitely be considered a trainee; and no other possible category was mentioned.

Some time after the Spens report had been accepted in principle, the Minister of Health let it be known that he thought it necessary for the hospital service to include a new category for doctors who, though they worked in specialties, could nevertheless not be regarded as full specialists—for example, many of the medical officers of mental hospitals and tuberculosis sanatoriums, many of the medical staff of pathology departments and venereal-diseases clinics, and many of the general practitioners holding appointments at small hospitals. For this category the name "senior hospital medical officer" was put forward; and it remains current, despite suggestions that graded, assistant, or associate specialist would be preferable, or that it would be best to call all these people specialists and use the title of consultant to distinguish those of staff rank. The salary range proposed for the senior hospital medical officer is £1300–1750, compared with a maximum of £1300 for a trainee specialist and a commencing salary of £1700 for the full specialist appointed at 32. It could be argued, therefore, that a man who has completed his training, but cannot for several years secure a full specialist appointment, would gain financially by spending these years as a senior hospital medical officer. But he may wonder whether, if he accepts such a grade, he will ever be able to escape from it, however well he works. By some, indeed, the very existence of this new category is seen as a threat to the whole system of the Spens report. A government, or a regional board, which was bent on retrenchment, could achieve it by reducing the number of full specialist appointments to a minimum, leaving nearly all its specialist work to be done by senior hospital medical officers. Already the Government have imposed drastic cuts on the expenditure of the boards, and it is feared that when the new staff establishments are announced next July there will be far fewer specialist appointments than there should be.

Granted that anxiety is reasonable, what action should be taken? Should we (as some think) endeavour to persuade the Ministry to withdraw the category of senior hospital medical officer? This would indeed ensure that everyone doing specialised work received specialist status; but by such an arrangement we should be jumping from one extreme to the other. A considerable proportion of the doctors working in hospitals before July 5 were not in fact regarded by their colleagues as consultants or specialists: in the eyes of the profession by no means every medical officer in a mental hospital was a specialist in psychiatry, and by no means every surgeon to a cottage hospital was a specialist in surgery. Surely, to insist that, because they are working for hospitals, all these doctors past the stage of training should be accorded full specialist status would be unfair alike to the real specialists, to the general practitioner, and to the taxpayer. It is hard to see how the hospital service could be conducted without the help of a certain number of experienced men and women who were content to do specialised work, sometimes of a routine kind, without claiming either the full privileges or the final responsibilities of specialist rank; and it seems proper that in the National Health Service these doctors should have some designation below that of specialist.

None the less, we believe the Ministry and the boards would go very far astray if they tried to run the hospital service without a sufficient number of doctors who have been given, and have accepted, the fullest clinical responsibility. A man's stature is apt to wax or wane according to what is expected of him; and, if we must err in some direction, the error of granting specialist status to those who do not, professionally speaking, deserve it would be less grave than the error of withholding it from those who do. The Minister's aim, like our own, is to create a better service, from the available material; and he must be well aware that the most important part of that material is its human element, which is highly sensible to downgrading.

Limp in Adolescence

IN young people many different lesions of the hip-joint can give rise to a limp. Strains around the joint are not uncommon and may result in traumatic synovitis; all hip movements are then restricted, though the limitation is much greater in the one or two directions in which movement would stretch the damaged tissues. The condition will settle rapidly with rest and simple measures without continuous traction. The early tuberculous joint—a less common cause—will not. Here one must not be misled by a history of antecedent trauma; it is so often possible to remember some previous injury, and nowhere else in the body is minor trauma so commonly the means by which more serious trouble is brought to light.

Why does a limp sometimes first develop only in adolescence, although the primary condition is of

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long standing? At this period the originally cartilaginous body of the epiphysis is so far ossified that little cartilage remains except at the epiphyseal plate and the articular surface. In earlier years there is little to differentiate the articular cartilage from the cartilage of the rest of the epiphysis, but as ossification progresses the cartilage cap becomes relatively and absolutely thinner, while the weight taken through the joint steadily increases. Even in the normal joint the head of the femur is not part of a perfect sphere; and very probably during adolescence, with a femoral head already distorted through old infection, subluxation, epiphysitis, or long-standing coxa vara, the loss of the resilient properties of the child's thick cartilage may be declared by the appearance of irritation of the joint with its attendant limp. Many cases of pseudocoxalgia, though they make a full functional recovery within 2–3 years of onset, give further trouble during late adolescence; and congenital subluxation of the hip may also first call attention to itself about this time.

In 1928 Sir THOMAS FAIRBANK[1] classified limps under five headings—the short-leg limp, the painful limp, the stiff limp, the weak-leg limp, and the hysterical or functional limp—and this classification forms a useful basis for diagnosis. The limp of a "spastic" has its own peculiarities but may reasonably be included with the stiff limps. Often, of course, we see a combination of two or more of these types in a single patient, but, keeping them in mind, it is sometimes possible to make a shrewd guess at the diagnosis simply from watching the patient walk across the room.

The boy with a *short leg* dips down on that side as he puts the foot to the ground; on the opposite side the hip is prominent and the knee may be kept slightly flexed. If the shortening is accompanied by instability of the hip from dislocation or severe coxa vara, the patient maintains his balance by swinging his body over the unstable joint; this is best shown in bilateral congenital dislocation where the shoulders swing from side to side in the typical duck-like waddle.

Where there is *pain at the hip* the weight is kept on that leg for as short time as possible; the foot—often the toes alone—is put carefully to the ground to avoid jarring the joint, and the sound leg is swung hurriedly forward with the weight dropping on to it at once. Usually, also, the sound side takes a much shorter stride than the painful side, which is unable to provide the necessary impetus to the body.

The gait of a patient with a *stiff hip* depends for its characteristics on the position of fixation of the joint. With ankylosis in the ideal position, a limp may be almost undetectable while the patient is clothed; knee and ankle work freely and the leg is swung forward by rotation of the pelvis on the spine in its vertical axis. But too much flexion or adduction—the commonest deformities—require lordosis or scoliosis of the spine in compensation and interfere with the rhythm of this movement. The limb with fixed adduction is "apparently" short; the hip is prominent; and the heel is not put to the ground.

The limp from a *weak leg* varies widely according to the particular muscles involved. The vast majority follow anterior poliomyelitis, and other muscles than those around the hip-joint are usually affected as well. Paralysis of the hip abductors gives perhaps the most characteristic limp, the body being thrown over to the affected side as weight is taken on that leg, in order to get the body's centre of gravity balanced over the joint. In contrast to this, the patient will show a positive Trendelenburg sign when standing still on the affected limb; the hip becomes prominent and the opposite side of the pelvis drops. The other conditions associated with this sign in the adolescent are congenital dislocation and severe degrees of coxa vara.

The *hysterical limp*, very seldom seen, may take any form; it may be an excellent imitation of one of the other types, but usually there is something of the bizarre in it. The negative findings in the hip on examination—which should be repeated—and the presence of other stigmata of a functional complaint usually make the diagnosis clear; the foot may be held in a deformed position, most often in varus.

What must the doctor look for when the limp apparently originates from the hip-joint? When he has assessed the patient and his history as a whole, let him methodically inspect and palpate the hip, and test its movements and power. On inspection, is there redness or swelling about the joint? Or wasting of muscle? In what position does the joint lie? Is there shortening, and if so is it apparent or real? On palpation, if shortening is present, is the greater trochanter raised? If so, is the head of the femur in the acetabulum (coxa vara) or dislocated? Is there palpable swelling, tenderness, evidence of an abscess, or lymphadenitis? Is there pain on jarring the limb? If examination shows limitation of movement, is this limitation in all directions or in some only? The slipped epiphysis early shows loss of abduction and internal rotation. Is there loss of power in any muscle-group? Finally, if there is doubt whether the lesion is really at the hip, does the cause lie in the spine, sacro-iliac joints, abdomen, or nether parts of the limb? The answers to these questions will often give the diagnosis; and with radiography of *both* hips—not forgetting the lateral view—the traps set by minor degrees of slipped epiphysis and very early tuberculous disease will lose their peril.

1. *Lancet*, 1928, i, 19.

Children in Hospital

THE tendency of teachers, of pædiatricians, and of psychiatrists to concentrate on their own fields has imposed an artificial division between the child's intellect, his body, and his emotions. Speaking at the symposium on child psychiatry held by the Royal Medico-Psychological Association on April 23, Miss ANNA FREUD said that this division was both harmful to the child and unhelpful to the workers, and she was thankful that today the sharp dividing lines are fading as teachers realise that the intellect will flourish only in a healthy emotional atmosphere, and as pædiatricians accept more and more responsibility for the child's mental welfare. Unfortunately, some large gaps remain unbridged, and the discussion on the management of "hospitalisation" in children showed an essential difference between the aims of the pædiatrician and those of the psychiatrist. The pædiatrician is thinking chiefly about the episode of the illness, and seeks a successful adaptation to institutional life and routine which will allow the work of healing to proceed smoothly. The psychiatrist takes a longer view; he welcomes the lack of disturbance, but he is mainly concerned with the preservation of the child's emotional ties with home, his continued dependence on those he loves—those to whom he must eventually return loving and if possible unchanged. Though both aims are directed towards minimising the mental upset caused by separation from home and a break with the familiar, it is clear

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that the immediate welfare of the body and the ultimate welfare of the mind need different treatment and divergent techniques.

So far as pædiatrician and psychiatrist are able to collaborate, their results are excellent. Dr. A. G. WATKINS gave an encouraging account of the way in which the pædiatrician plays into the hands of the psychiatrist where he can. He prepares a welcome for the child in hospital by arranging for a private interview on admission—a means whereby fears (of both child and parents) can be allayed, confidence established, and the process of adaptation begun. Having given the child this sample of the relationship he may expect between himself and his new environment, the pædiatrician calls on his chief ally, the ward sister, to consolidate his work. Her tact and experience will guide her in helping the child to settle and to make satisfactory contact with his new companions; she will spare no pains in adjusting the environment to his needs so far as this can be done, and she will provide suitable distraction or occupation. As a rule, unless there is maladjustment at home, children will respond to this treatment exceedingly well. They will be happy in hospital; they will submit to the ministrations of total strangers with apparent unconcern; they will bear no resentment if such ministrations are necessarily painful; and they will become cheerful, contented, and coöperative members of the community in which they have been placed. The pædiatrician's aim has been achieved, and he has every reason to be satisfied with his success; for the problem that preoccupies the psychiatrist is not apparent in hospital. Indeed the pædiatrician will need to go out of his way to find this problem, and is most likely to do so in the homes of children who have been discharged cured after long-continued and successful treatment in hospital. It will lie in these children's relations with their homes and families, and may manifest itself in any one of the disguises which emotional maladjustment can assume —from bedwetting to delinquency. If he inquires into the history of these troubles, he will often be astonished to hear that they are thought to date back to the time when the child first came home again; he will be dismayed by the frequency of this observation, once he has learned to look for it. It seems to him barely credible that the happy docile children who were such friends of his in hospital should be suffering from their stay there; and indeed, specialised knowledge, wide experience, and much patient work is needed before cause and effect become intelligibly related to each other.

Miss FREUD pointed out that the problem is most acute in the very young child staying a long time in hospital, and she described his emotional experiences at length, beginning at the point where damage first occurs—on admission. To the distress of the illness is added the distress of separation from home, and the child is quite defenceless. He submits with his body, but retreats with his mind; if this retreat is unchecked, his mental unfolding is temporarily arrested. He adapts easily through bodily surrender, and his memory is in any case short: he has not had time to forge a link with home which can withstand long strain. He lives from day to day, he depends on the evidence of his senses, and his understanding of the situation is fragmentary at best. A loving mother who remains absent is a figure whom he is incapable of conceiving; his own love demands the nearness of the beloved person, and if she withholds herself he lacks the only proof of love which he knows and can understand. His outward calm hides dejection and a feeling of having been abandoned by those he most cares about; he becomes inwardly apathetic, though capable of interest and animation on the surface. His roots in home are dying for lack of nourishment and he is learning to do without them, at the expense of his normal emotional life and growth. Miss FREUD was at pains to present him in all his mental isolation, because she felt that only those who fully understood it could help him. Such help demanded that the vital link of the child's affection for home be kept alive and intact—a thankless task for those who would love him and care for him outside his home. It was a case of deliberately sacrificing affection for oneself in order that the child may continue to love someone else, and it was a sacrifice which could only be made willingly. Miss FREUD thought that nurses who had the need for it explained to them might make this sacrifice gladly.

Unless, or until, we follow Prof. J. C. SPENCE's advice and practice, and admit the mother to hospital to help in looking after her child, the child's link with home will depend on the frequency and on the vividness with which contact is renewed through the mother's visits. Dr. H. D. HUNTER argued that greater frequency than once a week is necessary if contact is to remain effective in the very young child: experience with weekly visits shows that the desire for them falls off as time goes by, and eventually atrophies; and, if the child's memory and understanding cannot weather the weekly interval, it remains virtually isolated, though apparently in touch. It is true that the visits foster the child's dependence on home, and therefore disturb rather than pacify him. The fully hospitalised child who turns to his immediate environment for all his needs, and is satisfied, presents a striking contrast to the child who is frequently disturbed by his mother's visits and disappearances, often responding to them with paroxysms of grief and crying: the first child is placid and manageable, the second often fretful and discontented; and yet from the psychiatrist's point of view the contented child is storing up trouble, the rebellious child is lustily fighting clear of it. The very shrieks with which it proclaims its continued need for the mother give assurance that all will be well when the time comes to go home, and that the psychiatrist need fear no problem. To the nurses the shrieks are distressing evidence that the child is unhappy, that they have failed to reconcile him to his environment. The pædiatrician, who had asked them to do just that, finds himself in a very difficult position; he knows that the child must continue to belong to his home, but he would like to see him happy and responsive away from home; he deplores the disturbing scenes which disappearing mothers are apt to trail in their wake, and he is the last to want to add to the troubles of the nursing staff. In addition, he must contend with the risk of cross-infection which menaces the very young when exposed to frequent outside contacts. The question may arise: if the occasional physical risk can be avoided only

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by endangering the mental health and happiness of many, can we afford to avoid that risk?

The meeting did not attempt to solve the main problem—namely, how body and mind should be cared for simultaneously, and which should take precedence when. The answer, when it comes, must come from research, from pooling of experience, from coöperation among the professions, and from better training of nurses for the care of children. The difficulties of both the nurse and her teachers were ably explained by a senior member of the profession; on the one hand, the nurse is taught to make surgical cleanliness and systematic habit her second nature; on the other, she is now enjoined to tolerate play and disorder and to encourage activities which are part of healthy childhood, but which cannot be brought in line with either hygiene or method. The exercise of her judgment thus becomes more and more important, and speakers agreed that attention to her social and cultural background might well take the place of some of her present intensive training.

Annotations

SUPRARENAL HORMONE IN RHEUMATOID ARTHRITIS

LAST week we referred to the startling results achieved at the Mayo Clinic in the treatment of rheumatoid arthritis by a suprarenal hormone. Dr. Philip Hench, who is primarily responsible for this development, suggested in his Heberden oration last year that rheumatoid arthritis is potentially reversible; he showed that sometimes this disease apparently undergoes spontaneous cure and that the remissions associated with pregnancy and jaundice are far more satisfactory and commoner than those associated with any form of treatment, including chrysotherapy. These ideas he has reiterated this year.[1]

The first report on the new treatment[2] appears to substantiate Hench's suggestion. The adrenal extract used is Kendall's "compound E," the formula of which is 17-hydroxy-11-dehydrocorticosterone. In each of 14 patients with moderate or severe rheumatoid arthritis, improvement began a few days after intramuscular injections of this compound were started; pain, stiffness, and limitation of movements were reduced, and tenderness and muscular pains relieved; appetite and weight improved, and "toxicity" was replaced by a sense of well-being; and the blood-sedimentation rate fell. The work was controlled by substituting injections of cholesterol for compound E without the knowledge of the patients or the clinical observers; the result of each substitution was an exacerbation of the rheumatic process which was almost as striking as the effect of treatment.

As Hench points out, many further investigations must follow. Dosage, prolonged administration, and possible toxic effects must all be studied. Already observations on the use of this compound in other conditions such as myasthenia gravis and rheumatic fever are being planned; but in a chilling footnote Messrs. Merck & Co., its manufacturers, say that no supplies will be available before 1950—and very little even then. Meanwhile, further news of the trial by Hench and his associates may be given at the International Congress on Rheumatic Diseases when it opens in New York on May 30 (not May 3 as we inadvertently said last week).

1. Hench, P. S. *Proc. Mayo Clin.* 1949, **24**, 167.
2. Hench, P. S., Kendall, E. C., Slocumb, C. H., Polley, H. F. *Ibid*, p. 181.

RAPID APPRAISAL OF SENSITIVITY OF TUBERCLE BACILLI TO STREPTOMYCIN

To apply chemotherapy rationally a technique is needed by which the in-vitro sensitivity of the organisms under attack can be assessed rapidly. Tuberculosis presents a special problem. Current methods are too slow to be useful to the clinician and are also unsatisfactory because they are based on cultures in fluid media.[1] Resistant variants are known to occur naturally,[2 3 4] and may obscure results by outgrowing the parent strain. A recent Medical Research Council survey[5] suggests that the effectiveness of streptomycin in pulmonary tuberculosis depends upon the sensitivity of the infecting strain. Youmans,[6] Fisher,[7] and the Medical Research Council record that organisms recovered at intervals during streptomycin therapy became progressively less sensitive thus showing that repeated assays are needed. Pyle[2] and Yegian and Vanderlinde[4] estimated the proportion of resistant variants in sputum by making viable counts on solid medium containing a range of concentrations of streptomycin. The technique is laborious and takes 3–6 weeks for completion. Working directly on pathological material Bretey et al.[8] claim to estimate sensitivity in 5–6 days by microscopic examination of a battery of fluid and solid media containing varying amounts of streptomycin.

In this issue Dr. Sievers proposes the use of slide cultures. In 1941 Pryce[9] laid the foundations of the method by cultivating tuberculous sputum smeared on to glass surfaces. After treatment with dilute sulphuric acid to destroy contaminants, the smears were rinsed and then incubated for 5–7 days in lysed blood medium. When fixed and stained by Ziehl-Neelsen's method young colonies could be demonstrated microscopically. The technique has since been applied in many ways. Rosenberg[10] used Kirchner's synthetic medium and suggested on dubious grounds that sputa containing more than 1000 organisms per ml. should give positive results. Muller[11] modified Pryce's technique and studied the action of 'Promin,' sulphonamides, and other agents upon the growth of tubercle bacilli in sputum smears, grading colonies for comparison upon an arbitrary numerical scale of maturity. Smart[12] applied Muller's technique to diagnosis, using a 'Cetavlon' (cetrimide)-tellurite solution instead of dilute acid. Cruickshank[13] combined fluorescence microscopy with slide culture for diagnosis. The morphology of actively growing mycobacteria has been described by a number of workers,[14 15 16] and the effects of penicillin, streptomycin, and sulphathiazole upon the appearance of tubercle bacilli in microculture have been examined by Espersen.[17] In February of this year, at a laboratory meeting of the pathological section of the Royal Society of Medicine, a slide-culture method for the rapid appraisal of sensitivity was shown by P. Collard, Brian Lacey, and P. Mann, at the Westminster Medical School. In this, differential counts of growth forms were made upon films of tuber-

1. Medical Research Council. *Lancet*, 1948, ii, 862.
2. Pyle, M. M. *Proc. Mayo Clin.* 1947, **22**, 465.
3. Vennesland, K., Ebert, R. H., Bloch, R. G. *Science*, 1947, **106**, 476.
4. Yegian, D., Vanderlinde, R. J. *J. Bact.* 1948, **56**, 177.
5. Medical Research Council. *Brit. med. J.* 1948, ii, 769.
6. Youmans, G. P., Karlson, A. G. *Amer. Rev. Tuberc.* 1947, **55**, 529.
7. Fisher, M. W. *Ibid*, 1948, **57**, 53.
8. Bretey, J., Coletsos, P. J., Boisvert, H. *Ann. Inst. Pasteur*, 1949, **76**, 188.
9. Pryce, D. M. *J. Path. Bact.* 1941, **53**, 327.
10. Rosenberg, K. S. *Lancet*, 1943, i, 615.
11. Muller, H. *J. Path. Bact.* 1944, **56**, 429.
12. Smart, A. W. *Bull. Inst. Med. Lab. Technol.* 1945, **11**, 98.
13. Cruickshank, D. B. *Tubercle*, 1947, **28**, 97.
14. Ørskov, J. *Zbl. Bakt. (Orig.)* 1931–32, **123**, 271.
15. Wyckoff, R. W. G., Smithburn, K. C. *J. infect. Dis.* 1933, **53**, 201.
16. Wyckoff, R. W. G. *Amer. Rev. Tuberc.* 1934, **29**, 389.
17. Espersen, E. *Acta path. microbiol. scand.* 1949, **26**, 178.

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culous sputum incubated in Dubos's liquid medium [18] containing graded amounts of streptomycin. Unincubated controls were included so that clumped organisms would not be interpreted as growth forms. The results were expressed as a graph indicating the distribution of streptomycin sensitivity throughout the population examined.

These methods are not without their difficulties and limitations. They do not solve the problem of removing resistant contaminants, especially fungi, without impairing the viability of the tubercle bacillus. Moreover, the material to be assayed must contain considerable numbers of organisms to ensure adequate germination. Ørskov [14 19] emphasises the relation between germination percentage and inoculum density. When cultures already on artificial media are to be tested there is difficulty in producing a suspension of organisms free from small clumps that may simulate growth forms. On the other hand, the methods are technically simple and have the advantages that results are available quickly for clinical use and can be presented in the form of a distribution curve rather than an arbitrary and potentially misleading end-point. Surveys are still needed to define the relation between the clinical course of tuberculosis and the sensitivity of the infecting strain.

INDUSTRIAL NURSES

THE nurse famine is so acute that it is natural to hunt round for nurses who have been overlooked or otherwise mislaid. In a letter to the *Manchester Guardian* of April 20, Mr. R. L. Kitching suggested that if the 4000-odd nurses thought to be working in industry would return to the wards "the shortage of hospital beds would be ended at once." It hardly needed a subsequent letter (April 25) from Prof. R. E. Lane to puncture this optimistic assertion. Fewer than two-thirds of the nurses working in industry are State-registered; and even if they all returned to the hospitals they would do little towards staffing 57,500 empty beds. It is arguable, indeed, that their retirement from industry would mean a heavier case-load for the hospitals. The industrial nurse well trained for her job prevents much avoidable sickness. By noting early signs of occupational disorders, and referring the affected people to the doctor, she, as Miss L. Heys points out in the same correspondence, helps to safeguard workers from the more dangerous effects of poisoning, dust diseases, sepsis, and other hazards. Work of such wide and interesting scope is naturally attracting entrants; but it is more to our advantage to see that these are well trained for their job, and used economically, than to try to drive them out of this relatively new nursing field. Professor Lane suggests that we need more industrially trained State-registered nurses to supervise the work of a larger number of assistant nurses in industry; and by developing the service on these lines saturation point should soon be reached and any serious competition with the hospitals for staff would be avoided. Indeed, there need be no competition once the hospitals can offer their nurses similar hours of work and a like personal freedom to those enjoyed by the industrial nurse; for the wards certainly offer work of parallel or even greater interest.

Opportunities for training in industrial nursing are nowadays increasing. The Royal College of Nursing provides its own course, and Manchester University offers a six-month resident course for nurses taking the industrial nursing certificate of the college. Other bodies, including the Birmingham Accident Centre, train for their own certificates. Manchester University has plans for a two-year part-time extramural course, which will probably begin in the autumn, and will enable nurses already in jobs to work for the certificate. A new quarterly, the *University of Manchester Journal for Industrial Nurses*, will quicken the interest of those doing, or thinking of doing, this work. The first issue carries a witty and stimulating editorial, and some very good articles—on the pottery industry and the health problems it presents, on the Disabled Persons Act, on team-work in an occupational medicine outpatient clinic, on the nurse in her treatment room, on university departments of occupational health, and on extramural teaching. Lord Simon of Wythenshawe, in a foreword, points out that in training nurses for industry Manchester is serving the needs of its own region—one of the important functions of a university. Indeed, if preventive work has the value we believe, it is serving the needs of the whole country.

THE LOCK HOSPITAL

THE London Lock Hospital has a proud record of more than two hundred years [1] of devoted service to sufferers from venereal diseases—an achievement which can be properly assessed only in relation to the neglect which has so often hampered progress in this subject at larger and older hospitals. The proposal of the North-West Metropolitan regional hospital board to convert this institution, or its wards, to other uses will therefore be received with regret for sentimental reasons. But the proposal also needs careful examination on practical grounds.

The Minister of Health has said that our two main problems in public health are tuberculosis and the venereal diseases. It is true that venereal diseases have diminished to some extent, as was to be expected with the return of peace; but the Ministry's figures for successive years do not show the striking fall which would indicate that the problem is solved. (There is evidence, too, that many more general practitioners, impressed by the reputation and ease of administration of penicillin, are treating these patients privately, and there is no public record which gives figures for such cases.) In fact the problem remains a very large one; no solution is in sight; and the need is to increase facilities rather than reduce them. Any decision by the board to close one of the largest and best-appointed clinics in the centre of London would therefore need strong justification. The particular area which the Lock Hospital serves happens also to be a hotbed of venereal infection, and so is the surrounding district. It is an area where foreigners predominate, many with little sense of personal or civic responsibility, and some recently arrived from countries in which venereal infection is extremely common. Again it is the heart of the region frequented by the prostitutes of the West End. Few of the people of this area will travel for treatment even if they will attend at all, and there is no similar treatment centre within easy reach. This neighbourhood is a very special problem, and it may well be that the presence of the Lock Hospital is helpful to those concerned with public order.

It may be, however, that the board intends that the hospital should retain its outpatient clinic and lose only its wards—which were shortly to be reopened. Such a proposal is defensible on the ground that improved methods of treatment of the venereal diseases have diminished the number of complicated cases and hence the number of patients who require inpatient treatment: already in many places the beds formerly given to V.D. patients have been transferred to other purposes. But, though the treatment of V.D. in general wards has advantages, it also has disadvantages. Chief among them is the fact that when the patient is admitted to a general ward responsibility for him usually passes to

18. Dubos, R. J., Middlebrook, G. *Amer. Rev. Tuberc.* 1947, **56**, 334.
19. Ørskov, J. *Zbl. Bakt. (Orig.)* 1924, **92**, 312.

1. See *Lancet*, 1946, ii, 17.

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people without specialised skill in his disease or particular interest in his situation. Knowing this, the clinic doctor is naturally tempted to delay or deny admission in order that his patient may not be transferred to other hands: the man with a subacute complication must take his chance as an outpatient; though pyretotherapy with intravenous vaccine would help him, it is withheld; the elderly syphilitic has his lumbar puncture and returns home. Indeed, there can be no question but that beds are still required for the treatment of venereal diseases, and that for full medical efficiency those beds should be on the spot and in the care of V.D. specialists. To this the board may reply that medical efficiency is unimportant if the patient refuses to be admitted to the bed; and that surely the patient would far sooner be in a general hospital or general ward than in one labelled "V.D." This argument, however, appears to be more convincing in theory than in practice. Actually, the patient will be a great deal happier in a special hospital than in one where nurses and other patients regard him as unclean. Many people, including foreigners, seamen, and members of the underworld, are not in the least worried by going to a V.D. hospital; indeed they prefer it because they expect to get specially skilled care. And if the staff of the special hospital are also attached to general hospitals it should be within their powers to make whatever arrangement will best suit particular patients.

The Lock is unique in that it is the only hospital in London fully and solely committed to the care of this type of case. It has, therefore, considerable possibilities as the site of a first-class postgraduate centre for venereology which would not compete with undergraduate needs: it could, with the support of the teaching hospitals, provide for postgraduate study both by overseas students and by our own future consultants and specialists in the subject. We hope that the North-West Metropolitan regional hospital board will make no precipitate decision.

CONSTRICTIVE PERICARDITIS

ESTABLISHING a diagnosis of constrictive pericarditis is more than an academic exercise, since surgical treatment may reduce or even remove symptoms.

Paul White and his colleagues [1] have lately described 53 cases seen between 1914 and 1947; two-thirds of these were in men, and about one-third of the patients were over the age of forty. The commonest symptom—and the one that generally came first—was dyspnœa (without orthopnœa), and the authors give evidence that this is due, not to the hydrothorax or ascites or cardiac arrhythmia, but to the constriction of the heart itself. Next in order of frequency came swelling of the ankles and legs and of the abdomen, enlargement of the liver, prominence of the neck veins, ascites, peripheral œdema, and signs of fluid or of pleural thickening at the lung bases. It is often said that with typical constrictive pericarditis enlargement of the heart is not observed, but the heart was enlarged in just over half the cases of this series. Absence of cardiac pulsation on screening—an important sign—was found in only about three-quarters. Valvular disease was absent, as also was a rheumatic history; so these cases differ from rheumatic pericarditis. In more than half the patients a hydrothorax was present on one or both sides, while in more than half the pericardium was calcified. Arrhythmias (most often fibrillation) were present in over one-third, and abnormal T-waves in four-fifths. In about one-fifth of the cases White obtained evidence of previous acute pericarditis.

The ætiology is still uncertain. G. W. Pickering has suggested that it is nearly always tuberculous; that of all forms of pericarditis the tuberculous is the most likely to be overlooked; and that in those who survive tuberculous pericarditis, constrictive pericarditis generally ensues. White separates a group of 9 cases that were certainly tuberculous and differed from the others by the shortness of their history; moreover, in these calcification and cardiac arrhythmia were absent, owing, he suggests, to the relatively short duration. Of late years tuberculous pericarditis has been recognised as less rare than was supposed; and there is now increased disposition to attribute constrictive pericarditis to this cause.

As to treatment, Andrews, Pickering, and Holmes Sellors [2] report that of 9 cases which were operated on 6 were greatly improved. Of White's 53 patients, 42 had an operation; in 60% the results were satisfactory, though some needed a second operation. White and his associates point out that the operation is sometimes difficult, for the constriction may be very widespread, involving the left ventricle as well as the right side; and indeed they describe 3 cases where the left ventricle was predominantly involved. They also emphasise that the calcification and adhesions may spread deeply into the heart muscle. Plainly, operation often gives excellent results when it is undertaken by one skilled in the surgery of the heart. At the same time, if the patient's symptoms are slight and can be improved by medical treatment, surgical intervention is probably best withheld; for in such cases the outlook is good.

SIR LAURENCE BROCK

Sir Laurence Brock, who died at Oxford on April 29 at the age of 70, was best known for his work at the Board of Control, of which he was chairman from 1928 to 1945. Educated at Dulwich and at Corpus Christi, Oxford, where he gained a double first, he entered the civil service in 1903; and his subsequent appointments included that of assistant secretary of the National Health Insurance Commission, secretary of the National Relief Fund, and principal assistant secretary to the Ministry of Health. This wide experience proved invaluable when he joined the Board of Control. Almost at once he found himself in the midst of new legislation; and he was largely responsible for the proposals which culminated in the Mental Treatment Act of 1930, by which a rate-aided patient was enabled to enter a mental institution on a voluntary basis. Three years later, in the Brock report on sterilisation, he collated the views of his committee with matchless simplicity and clearness.

In mental health he was quick to see the widening field; but he also saw that this field could not be fully explored so long as the psychiatric services remained in isolation. Thus in his Maudsley lecture of 1945, he said [3]:

> "The solution of this problem is not the development of individual institutions but rather the devising of a system under which psychological medicine can be effectively integrated with general medicine, and mental hospitals and ancillary institutions with their staffs brought into closer relation with the rest of the public-health service."

This conviction of his, reiterated with gentle force, contributed to the decision that the mental-health services should be included in the National Health Service.

To the daily task he brought an orderly mind and a remarkable memory. The combination of a classical education with the training of a civil servant aided his natural power of expression, and he was a master of the written memorandum. In middle age the onset of slight deafness handicapped him at the conference table, though this impediment was not always obvious even to his colleagues. An unusually contented family life may have accounted partly for his constant sympathy with the mentally ill and with others in misfortune.

1. Paul, O., Castleman, B., White, P. D. *Amer. J. med. Sci.* 1948, **216**, 361. White, P. D., Alexander, F., Churchill, E. D., Sweet, R. H. *Ibid*, p. 378.
2. Andrews, G. W. S., Pickering, G. W., Sellors, T. H. *Quart. J. Med.* 1948, **17**, 291.
3. *Lancet*, 1946, i, 333.

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Special Articles

USE OF CONDUCTING RUBBER TO ELIMINATE ELECTROSTATIC HAZARDS IN OPERATING-THEATRES

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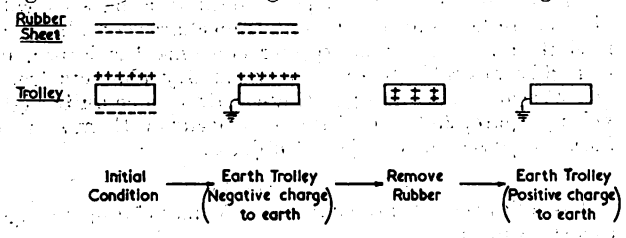
IN operating-theatres the risk of an ether fire, or of an explosion of ether vapour and air, arises mainly from two sources: (1) electric arcs or sparks may be produced in diathermy apparatus, non-flameproof switches, and faulty lamp or other wander leads; and (2) a conducting or semi-conducting body carrying an electrostatic charge may produce a spark on discharge. We are here concerned only with this second risk.

Static electricity is generated whenever two dissimilar surfaces are brought into intimate contact and then separated. When both surfaces are conducting, there is little apparent separation of charge, since both will be maintained at the same potential until the last instant of contact. Considerable electrification occurs on separating a good conductor and a good insulator. The charge over



the conducting surface can be completely removed by connecting any point on it to earth, while the non-conductor will retain its charge unless the whole surface is earthed or the ambient medium made conducting.

Further hazards are associated with a highly charged non-conductor because it can lead to the separation of charges on any conducting body which it approaches. A non-conductor carrying a high charge is therefore a constant source of danger. The discharge of a small area may lead to a large enough spark to ignite a mixture of ether vapour and air—this being unlikely but by no means impossible. The discharge of any insulated conductor or semi-conductor—e.g., personnel—in its vicinity certainly can lead to a spark of many times the energy required to ignite such a mixture. This second hazard is by far the greater, since in this case a charge equivalent to practically the whole charge on the insulator can be released at once.

In operating-theatres electrostatic charges are found on insulating rubber surfaces (negative charges) and on dry blankets (positive charges).

Induced charges are to be found on conducting objects such as metal trolleys, tables, and personnel, if these are insulated from earth. The mechanism of induction and the production of free charges can be illustrated as follows. When a negatively charged sheet of rubber is placed on an insulated neutral metal trolley, the charges on the trolley separate, the positive charges collecting close to the rubber sheet—these charges are bound so long as the rubber sheet remains in position—and the negative charges remote from it. These negative charges are free and can be removed by earthing the trolley. When the rubber is removed the bound positive charges on the trolley become free and can be removed by earthing the trolley (see accompanying figure). Any person wearing insulating footwear who comes close to the charged rubber is a potential source of an electrostatic discharge; if he is discharged while close to the rubber he again becomes charged when he leaves it.

In the laboratory it has been shown that the discharge of an insulated trolley or person can release enough energy to ignite a mixture of ether vapour and air.

Precautions which are customarily taken against electrostatic discharges are (1) the earthing of metal objects—and even personnel—by trailing chains and (2) the humidification of the atmosphere. These methods are not entirely satisfactory. The conduction through the chain links may be unsatisfactory, and the chains are liable to mechanical derangement. Humidification of the theatre atmosphere lessens, but does not entirely remove, the danger. During the 1939–45 war one of us (F. J. L.) found that, in factories where electrostatic charges were troublesome, humidification to the point of extreme discomfort to the workers failed to remove the trouble.

Ordinary non-conductive rubber is used in operating-theatres in many forms, such as sheets, mattresses, pads, tubing, masks, footwear, flooring, and wheels and feet for apparatus. It acts both as a generator of static charges and as an insulator which prevents earthing of apparatus and personnel. It is therefore evident that the substitution of the normal insulating form of rubber by rubber which will conduct electricity will minimise the hazard associated with insulating rubber by preventing the retention of both generated and induced charges. The technique for the manufacture of conductive rubber by the addition of certain forms of carbon to rubber was developed just before the war and is now widely used in industry. This product is comparable with normal rubber in every other property. (The colour of this material obviously is black.)

EXPERIMENTAL OBSERVATIONS

During 1946, experiments were made in the operating-theatres of the Queen Elizabeth Hospital, Birmingham, to examine the factors involved in static electrification and to test the efficiency of conductive rubber in removing it. All the measurements of resistance and of electrostatic voltage and quantities were made with an apparatus previously described by one of us (Bulgin 1945).

The static charges generated when a dry blanket is drawn over a rubber pad measuring 6 ft. by 1 ft. 9 in. by 1 in. (the major source of static) lying on a metal trolley, and the resistance to earth of objects in an operating-theatre (of importance in considering induced charges) were measured. The values obtained were as follows:

Experiment	*Procedure*	*Voltage found*
A	Standard insulating rubber pad on trolley insulated from earth; dry blanket drawn rapidly over pad.	Rubber 14,000 V negative; induced on trolley 10,000 V positive.
B	As above but with trolley chain trailing on granolithic portion of floor (theatre floors granolithic with brass-strip inserts forming 2 ft. squares, and brass strips are bonded together and to a brass network on which granolithic floor is laid).	Rubber 14,000 V negative; induced on trolley 9–12,000 V, decreasing in a few seconds to 800 V.
C	As above but trolley efficiently earthed.	Rubber 14,000 V negative; trolley nil.
D	Pad made of conductive rubber; trolley insulated from earth.	Rubber 8000 V negative; trolley 8000 V negative.
E	As above but with trolley chain touching floor.	Rubber and trolley 8000 V negative, decreasing in a few seconds to 800 V.
F	As above but trolley efficiently earthed.	No volts appeared on either rubber or trolley.

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It will be seen that, when a conductive rubber pad is used on an efficiently earthed trolley, no static can be detected (experiment F), but that the normal trailing chains (experiments B and F) are inefficient because of the high resistance both to the floor and between links unless the chain is taut.

It should be noted that the conductive rubber does not of itself avoid the generation of static (experiment D); its function is to ensure that the static generated is carried to earth.

In experiment A, when the induced charge on the trolley which had a capacity of 3×10^{-10} farad was discharged to earth, a spark about $^1/_4$ in. long was obtained, and the total energy calculated to be 3×10^{-2} joules. Since the least energy required to ignite ether vapour is $4{\cdot}5 \times 10^{-4}$ joules (Boyle and Llewellyn 1947), it will be appreciated that the observed charge is many times greater than the danger limit.

With this experimentally determined value for the danger limit and the relationship $E = {}^1/_2\ CV^2$ (where E = energy in joules, C = capacity in farads, and V = potential in volts) it will be seen that $4{\cdot}5 \times 10^{-4} = {}^1/_2 \times 3 \times 10^{-10} \times V^2$ or V = 1700 volts. This indicates that, under the conditions mentioned, there is danger when the potentials induced on such apparatus exceed 1700 V.

In a second series of experiments the resistances to earth of various objects in the theatre were measured. This value is important because the time of discharge of a charged body to any lower voltage can be calculated from the formula:

$$t = \frac{R.C.\ (\log_{10} V_0 - \log_{10} V_t)}{0{\cdot}43}$$

(where t = time in seconds, R = resistance in ohms, and C = capacity in farads. V_0, V_t = voltages at time 0 and after time t respectively).

The capacity to earth of a man in shoes, or of a theatre trolley, is about 3×10^{-10} farads. The times taken for the voltage of one of these systems to fall to about 5% of its initial value, calculated for different resistances, is as follows:

R in ohms	10^6	10^7	10^8	10^9	10^{10}	10^{11}	10^{12}	10^{13}
t in sec.	0·001	0·01	0·1	1	10	100	1000	10,000

The values of resistances measured were as follows:

Resistance Tests with Potential −4 V to Earth by Leakage from Condenser

			Ohms
1	a	Man (1) in leather shoes	$1{\cdot}5 \times 10^9$
	b	Man (2) " " "	Less than 10^7
	c	Man in leather shoes with rubber soles and heels	$2{\cdot}5 \times 10^{10}$
	d	Man in white rubber boots	Greater than 10^{13}
	e	Man in black rubber goloshes over shoes	10^{11}
2	a	Operating-table with trailing chain resting on granolithic floor	4×10^9
	b	Operating-table with chain held under tension to earthed metal bar in floor	Nil
3	a	Instrument table with chain as in 2a	3×10^{10}
	b	Instrument table with chain touching metal bar (chain not taut)	10^9
4	a	Trolley on rubber wheels with earth chain resting on floor	10^{11}
	b	Trolley on rubber wheels with chain removed	Greater than 10^{13}
5		Man lying on operating-table on rubber pad and covered with blankets	2×10^{10}
6		Man standing in conductive rubber gum-boots on concrete floor	2×10^6

In many cases the resistance is high enough to enable static charges to be retained for appreciable periods. In general the resistance of personnel to earth when wearing rubber boots is excessively high, and trailing chains do not provide a satisfactory earth for trolleys. This conclusion is confirmed by the observations under experiments B and E in measuring the voltage.

The upper value of resistance to earth should not exceed 10^9 for the rapid discharge of static to a safe value. At the same time it is unnecessary to reduce the resistance to less than 10^6 ohms, because lower values can introduce dangers from fire or shock to personnel if accidental contact is made with a live electric main owing to faults in apparatus. The values of currents flowing from the mains through various resistances (for 230 V main supply) are as follows:

Resistance (ohms)	10^4	10^5	10^6	10^7
Current (mA)	23	2·3	0·23	0·023

It will be seen that resistance values less than 10^5 ohms allow the passage of currents which can cause appreciable shocks or even risk of ignition of the rubber. It is therefore strongly recommended that in theatre work the resistance of objects to earth should be 10^6–10^8 ohms for dissipation of static charges. Resistances of less than 100,000 (10^5) ohms or more than 10^{10} ohms should be regarded as dangerous.

BLANKETS

The rapid absorption of moisture by blankets and consequent reduction of resistance allow charges developed on blankets to dissipate more readily than the corresponding charges on non-conductive rubber.

Certain experiments (Walker 1930, Weigerink 1940) have shown that, for the specific resistance to be less than 10^{13} ohms, the moisture content of the blanket should be greater than 16% by weight. This is obtained if the blanket is stored in an atmosphere of 65–70% relative humidity. The effect of temperature is small, and the above value holds from room temperatures to 140°F.

These conditions of storage will ensure that any static charges generated will leak to earth in general in a time less than 1 sec.

The efficient earthing of personnel and apparatus will also ensure that any risk arising from charges on blankets is slight; but if normal rubber equipment is in use, it is highly desirable to exclude warm dry blankets from anæsthetic rooms and operating-theatres since quite high voltages (circ. 25,000 positive) can occur on them and so induce charges on to adjacent objects.

RECOMMENDATIONS

The following recommendations are made for operating-theatre work:

(1) Mattresses, rubber sheeting, footwear, feet for apparatus, and trolley-wheel tyres should be made of conductive rubber of the correct specific resistance.

(2) It is undesirable to rely on the fitment of one conductive rubber tyre to a theatre trolley. Preferably all four tyres should be of conductive rubber.

(3) Gum-boots should be of conductive rubber or at least have conductive soles and insoles.

(4) Overshoes should be prohibited.

(5) Where rubber flooring is used in the theatre it should be conductive.

(6) Woollen blankets should be stored in an atmosphere of not less than 65% relative humidity.

SUMMARY

Quantitative measurements of electrostatic charges developed on personnel and equipment in operating-theatres are reported.

The results clearly indicate that there are hazards in using non-conductive rubber equipment, and that the danger can be eliminated by the use of conductive rubber equipment, particularly for mattresses and rubber in contact with the floor.

The resistance to earth of the objects supported on rubber should be 10^6–10^8 ohms; higher or lower values introduce danger.

We thank Dr. B. L. S. Murtagh, senior anæsthetist, and Mr. C. E. Forryan, chief engineer, both of the United Birmingham Hospitals, for their interest and encouragement in this work.

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SPONDYLOLISTHESIS

PROFESSOR HARRIS'S HUNTERIAN LECTURE

ON April 29, at the Royal College of Surgeons, Prof. R. I. HARRIS, of Toronto, received the honorary fellowship of the college and before a large audience delivered a Hunterian lecture on Spondylolisthesis.

Professor Harris remarked that among the numerous causes of low-back pain spondylolisthesis is of special interest because of its problems of ætiology, diagnosis, and treatment. Patients with symptoms are only a fraction of those who possess the essential vertebral defect. Apart from Friberg's monograph and Meyerding's paper, most articles deal with small numbers of cases.

The essential defect in the neural arch between the superior and inferior articular facets is well known and occurs most often in the 5th lumbar vertebra. The defect produces an unstable spinal column and allows the body of the deficient vertebra to slip forward, carrying with it the superimposed spinal column. The small posterior fragment maintains its normal relationship to the subjacent vertebra. The defect may be found without any anterior displacement of the body (spondylolysis). In such cases the defect may be unilateral or bilateral, and is difficult to detect without oblique radiographs of the spine. Rarely anterior displacement of the 5th lumbar vertebra on the sacrum may take place as a result of injury to, or a deficiency of, the superior articular facet of the sacrum. In such cases the whole of the 5th lumbar vertebra is displaced forward.

ÆTIOLOGY

Despite much work, little is known of the ætiology of the neural-arch defect. It has commonly been supposed to result from deficient fusion of the centres of ossification in the neural arch. The work of Willis and of Grant has shown that the incidence of these neural-arch defects in adult cadavers is 5%. If the defect is a developmental anomaly, one would expect a similar incidence in fœtuses. Batts, however, examined 200 fœtuses without finding any defect in the 5th neural arch. It has been suggested that the lesion might result from a hyperextension injury sustained at birth. The pars interarticularis is then bony, and if the lesion were produced by fracture at this site callus formation would be expected; this has never been reported. The same criticism applies to the theory that trauma sustained in adult life is the ætiological factor. Notwithstanding lack of positive evidence, the lesion probably arises as a result of deficient ossification, the nature of which is still unknown.

Trauma, though it may not cause the neural-arch defect, probably precipitates the anterior dislocation that later occurs gradually. Most patients relate the onset of their symptoms to some specific injury. Of 100 patients, 16 described a sudden hyperextension strain and 39 some other kind of injury, generally a fall on to the buttocks; in the remaining 45 there was no history of injury.

SYMPTOMS AND SIGNS

The clinical picture has two main features—pain and deformity. Both arise from the instability of the spine. The pain is of two types. The first type, due to instability alone, is felt in the low lumbar region; it is aggravated by weight-bearing and activity, and is relieved by rest. The second type of pain, due to root-pressure, may arise from a prolapse of the lumbosacral disc, causing pain in the 1st sacral area or from compression of the 5th lumbar roots by narrowing of the intervertebral foramina. The former root symptoms are usually unilateral and the latter bilateral.

The deformity in spondylolisthesis is produced by the anterior displacement of the vertebra and superimposed spinal column and by compensatory changes that follow. In the case of the 5th lumbar vertebra the spinous process remains in situ, producing a step between the 4th and 5th spinous processes which can be detected clinically. In order to maintain the erect posture in the presence of marked anterior displacement, there is an increase in the lumbar lordosis, and at the same time a backward rotation of the pelvis which brings the sacrum more vertical. Normally the anterior superior spines lie at a lower level than the posterior superior spines; in some cases of spondylolisthesis this relationship is reversed. As a secondary effect of backward pelvic rotation, there may be limitation of extension of the hip-joint. The patient then adopts a peculiar stance, either with slight flexion of the hips and the trunk leaning forward, or with the trunk erect and the hips and knees slightly flexed. Rarely there is an asymmetrical degree of slipping; and then lumbar scoliosis is added to the other deformities.

TREATMENT

The condition may be treated conservatively by means of a spinal support, or surgically by spinal fusion. It requires nice judgment to select cases for operation, but in the main it may be said that fusion is recommended for the young and for patients with severe symptoms. Correction of severe displacement may be attempted before fusion, by skeletal traction applied to the lower femora and counter-traction by means of a "vest" fastened to the chest with 'Mastisol' and to the head of the bed by shoulder-straps. Replacement of the sacrum under the lumbar spine is effected by forward skeletal traction through each anterior superior spine. Satisfactory correction was obtained in the 4 cases treated in this way.

Professor Harris roundly condemned anterior fusion by the abdominal route. Such a graft contravenes the general principles of bone-grafting in that it has to cross the relatively avascular area of the intervertebral disc. Moreover the approach does not allow for exploration of possible causes of root-pressure. The only patient so treated subsequently developed intestinal obstruction and a ventral hernia, while the graft fractured. Satisfactory posterior spinal fusion can be obtained in a high proportion of cases only if the graft is massive, the anchorage to the sacrum is large and secure, the graft does not extend beyond the vertebra above the lesion, and adequate postoperative recumbency is maintained for at least four months. Professor Harris uses twin tibial grafts supplemented with cancellous chips. The lower end of the cortical grafts are slotted into windows cut into the posterior aspect of the sacrum, and above this level are secured to each other and to the spinous processes by stainless-steel wire. Extension of the grafts to the 2nd vertebra above the lesion has led to fracture of the graft and is now avoided. Plaster-beds for recumbency have been abandoned in favour of Stryker frames, which can be turned with great ease. A brace is worn for the first six months of ambulation. Of the 100 patients reviewed, 67 were treated by operation, and in 56 of these the results were satisfactory.

HONOURS FOR THE KING'S DOCTORS

HONOURS for the following doctors who attended the King during his recent illness are announced:

G.C.V.O.

Sir MAURICE CASSIDY, K.C.V.O., C.B., M.D. Camb., F.R.C.P.
Sir THOMAS DUNHILL, K.C.V.O., C.M.G., M.D. Melb., hon. F.R.C.S., F.R.A.C.S.
Sir MORTON SMART, K.C.V.O., D.S.O., M.D. Edin.

K.C.V.O.

HORACE EVANS, M.D. Lond., F.R.C.P.
JAMES PATERSON ROSS, M.S. Lond., F.R.C.S.

M.V.O.

CEDRIC JAMES LONGLAND, M.B. Lond., F.R.C.S.
ALEXANDER JOHNSTON SLESSOR, M.B. Aberd., F.R.C.S.

The appointment of Professor Learmonth as K.C.V.O. and of Dr. John Gillies as C.V.O. was announced in March.

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Reconstruction

THE NEW UTILITARIANISM

FROM A CORRESPONDENT

IN a recent letter to the *Times* Mr. Quintin Hogg observed that the return of the Socialists in 1945 was no ordinary election, but was to be compared with the passing of the Reform Act in 1832, and regarded as inaugurating a new era, that of Democratic Socialism. He was using the comparison to draw a political moral; but there is another parallel between the two periods which may well be very relevant to the future of "social medicine," and we shall perhaps do well to glance back at the history of the radical philosophy associated with the name of Jeremy Bentham.

A REVIVAL

Writing of the legislation following 1832, Trevelyan describes how

> "the life of the community began to be remodelled according to the actual needs of the new economic society. The spirit of Jeremy Bentham was abroad in the land, though the old man himself was on his death bed. His test question—What is the use of it?—was applied to one venerable absurdity after another."

If only Benthamism had been aware of the limitations of its mechanical psychology, how different would have been the history of the 19th century in England! But, valuable though it was as a challenge to the venerable absurdity, the utilitarian philosophy was over-simplified and hence gave rise to the excesses of the system of laisser-faire with its Malthusian hard-heartedness towards the human elements in the industrial life of the country. Benthamism became at last the handmaid of the industrialist, and forwarded the dominance of industrial techniques over fundamental human rights and needs.

Most happily for us, the medical and hospital world was not wholly engulfed in these events. Certainly Benthamite thought played a large part in determining the shape of the hospital services provided at the public expense in the latter half of the century; but the traditions established by the voluntary-hospital movement of the 18th century proved strong enough to weather the storm, and preserved a tradition of common humanity between doctor, nurse, and patient which the utilitarian philosophers, with their formula "what is the use of it?" sometimes found provocative. The extraordinary, almost anachronistic, survival of the voluntary-hospital system into the middle of the present century would be inexplicable were it not for the support it received from many who adhered instinctively, despite all the anomaly, to the belief that the voluntary system preserved something of profound value. In retrospect, how right they were, those men of the '80s, '90s, and early decades of the 20th century, who refused to turn the hospitals over to a State which was not yet for many a year to be converted to a genuine pursuit of social welfare! The dangers which would have attended a premature transfer of the hospitals to the State have largely disappeared: the hospitals are not now likely to be starved and the generous financial arrangements of the first few months are a curious witness to the adoption by the social democratic State of an entirely new philosophy of the proper use of public money. It is not, as some are tempted to suppose, a midsummer madness; the check to the spending process which has just been administered by Mr. Bevan is far less significant than the new high-water mark which he is establishing for public expenditure on hospital and medical services.

But though the risk that the hospital system will be directly subjected to a utilitarian economy may have passed, there remains another and more subtle danger which may yet be the cause of travail such as beset the 19th century. Discarded in the economic and to a great extent the political world in favour of the more humane conceptions of social democracy, the Benthamite criteria are to be discerned making a subtle re-entry into our thinking, this time in medicosocial matters. There they find a delightful meadow where they may parade around in sheep's clothing, and escape recognition.

THE MODERN VERSION

Two main themes may be distinguished, and both may fairly be said to be derivatives of Benthamite thought.

First there is the new egalitarianism. Not only must a man have a vote and an opportunity to succeed in life, as was good 19th-century doctrine, but there must be equality as between institutions and other inanimate objects—such as, in certain instances, rates of pay. Let us consider, for instance, what happened in regard to the rates of pay of student nurses when the Rushcliffe Committee got to work in 1942. The committee found that there was a great disparity between, on the one hand, hospitals such as St. Bartholomew's and St. Thomas's, where not only was the rate of pay relatively low but fees were demanded from the student, and on the other hand the hospitals belonging to the county councils where the rate of payment had been pushed up in an endeavour to attract more candidates. The first act of the Rushcliffe Committee was to sweep away these disparities. The line of thought followed was curious. Competition between hospitals was, it was felt, bad, and it would be remedied by a uniform rate of pay; but of course the effect of this was simply to enhance the competitive power of St. Bartholomew's and St. Thomas's, and still further to embarrass the municipal hospitals. In other words, attainment of the objective of equality of rates of pay in pursuit of a theoretical egalitarian ideal greatly aggravated the already existing maldistribution of student nurses. (Opinion is changing as a result of this bitter experience, but it has not yet gone far enough, and in the meantime the concentration of nurses in the most favoured hospitals continues.) It is not at all far-fetched to attribute these troubles to the unrecognised and much misunderstood ghost of Jeremy Bentham.

Secondly, there is the belief, now often openly stated without any apparent twinge of conscience, that the aim and objects of the hospital services—and even sometimes the work of the doctor or nurse—may be related without qualification to national productivity. Again we may draw examples from the nursing field. The locus classicus is surely to be found in the report of the Working Party on Nursing (my italics):

> "The problem of staffing the nursing services cannot be isolated from other health and social problems. Indeed, *setting aside humanitarian considerations*, it might be regarded as an economic problem. The basic question calling for an answer might be formulated as how best we can employ the economic and manpower resources available to achieve an increasingly higher standard of health in the community."

Similarly, Mr. John Cohen, PH.D., in his minority report, discussing the number of nurses, says:

> "There will be an *optimum* distribution of man and woman-power between different occupations, the optimum being judged by changes in total production resulting from different man-power allocations, and there will also be an optimum number of hospital beds."

Many of the implications of Dr. Cohen's views have provoked an instinctive reaction from the nursing profession which does the profession great credit. But it is the subtler forms of the doctrine which are more dangerous, and a good example is to be found in the current enthusiasm for a "job analysis" of nursing. The aim of the hospital nurse is still, at any rate in this country, instinctively understood to be primarily the relief of pain and distress and the comforting of the

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patient; but this aim is becoming subordinated to a new conception with an American ring—to wit, that the nurse is primarily a skilled medical auxiliary. Even Dr. E. B. Brooke and Mr. J. P. Wetenhall [1] can write:

> ". . . the skilled nurse will need to have a greater realization of the two-sided nature of her work. One side, of course, is the exercise of her skill on a particular patient requiring it; the second side is the avoidance of wasting her time on duties which fall within the competence of others not possessing her skill."

and from the context it is clear that the unskilled nursing, which she is to delegate to others, is precisely ministering to the patient's comfort. This is a view that needs to be challenged time and again, whenever it makes its appearance. The fact is that it is the comforting which is important to the patient, and it is the comforting which makes the most exacting demands on the nurse, against the demands of which her training should offer her support and guidance; yet it is the comforting which will not appear in any analysis made by teams of investigators working in shifts day and night so that "all actual duties performed by the nurse may be accounted for."

The utility of a job analysis in regard to nursing is in fact very limited: how can it take account of the need of a young nurse for a little simple domestic duty out of the public eye where she may recover herself from a wounding rebuff from a neurotic patient, or a fresh realisation that a patient for whom she has come to care deeply cannot possibly recover? It is a danger in nursing today that domesticities may be so refined away that no time or opportunity is left for the essential human contacts with her patient which make nursing worth while.

It is time that the function of the nurse was restated in terms that leave no room for comparisons with the mechanical duties of the girl in the factory. Mr. A. R. J. Wise [2] falls into the new utilitarian trap when he writes:

> "In the past a sick worker has been the object only of social and humanitarian concern, because there was always a substitute in good health ready to take his place in the economic system. Under full employment, however, he is irreplaceable: it therefore becomes a paying proposition, as well as a moral obligation, to devote substantial resources to the job of getting him fit again."

And again:

> "It would be uneconomic, for instance, to save another hundred 'man hours' of absenteeism among cotton operatives at the cost of another two hundred 'man hours' of nursing care; the same object could be attained more cheaply by attracting girls into cotton mills rather than into nursing. Moreover, a point would be reached—and is likely to be reached much sooner—at which further hospital expenditure, though still socially profitable, would yield a smaller gain in national fitness than would the same amount spent in other ways."

But since when was it the object of the hospitals to serve economic ends? We are on dangerous ground indeed if we are going to determine hospital budgets in the light of their relation towards a policy of full employment. Simpler methods of dealing with patients, of which we have had too many examples in recent years under totalitarian régimes, come quickly to mind. No: it is true that we may have to call a halt to the provision of hospitals and other social services because we have reached the limit of our capacity to provide them; but that is quite another matter.

MISLEADING THE UNWARY

Probably all nursing and hospital questions, many aspects of social medicine—should we not add many an aspect of medicine itself?—are vulnerable to the infiltration of this form of thinking that derives from the philosophic radicalism of the earlier years of the 19th century. (Let any who doubt the derivation reflect how foreign such a way of thinking would have been to the philanthropic approach of the earlier part of the 18th century.) It is indeed easy to understand how it is that these ideas come so easily into our minds, for we have to look no further than to the emphasis now placed in many universities upon the study of social and political history, and the rudiments of economics. It is not to much to say that a large part of the the educational world—not of course including medical or nursing education!—is soaked through and through with the tenets of a Benthamite philosophy, reached by the simple route of studying and discussing the history of the 19th century without any comparable emphasis on the corrective processes of more recent epochs which have brought these doctrines into discredit.

The application of these ideas to the very different, fundamentally deeper, and older ranges of human experience which are the subject matter of medicine is, and will continue for some time to come to be, a tempting pastime. The data offered by medicine and its allied fields may easily be combined with a little Benthamite theory to offer many novel propositions calculated not only to mislead the unwary but also to damage our heritage over large sections of the national life which managed to escape the sway of the Benthamites a century ago.

Said Macaulay of the "greatest happiness" principle of the utilitarians, with justice: "Unlimited, it is false. Properly limited, it will be barren."

1. *Brit. med. J.* March 19, p. 491.
2. Your Hospital: Heritage and Future. London, 1949.

Disabilities

29. RHEUMATOID ARTHRITIS

In January, 1941, when I was 52, my fingers, wrists, and feet, and especially my toes, became very painful and swollen with arthritis. I could no longer sew or knit, or do ordinary housework; writing was painful, and I could not walk in comfort.

I was given electrical treatment and radiant heat, which helped at the time and for a short while afterwards. Nevertheless the trouble slowly advanced. In November, 1941, I had four gold injections, and these were unfortunately followed by a bad attack of dermatitis, which sent me into hospital for 3 months and to bed at home for another 6 weeks. A recurrence, some months later, lasted 5 weeks and was mainly on my hands and feet. In spite of various treatments, the arthritis got worse, and in 1943 my left thumb became so painful that I could not use my hand. It was splinted for 8 weeks, with such success that I have had little pain in it ever since, though the joint is much enlarged. The worst of arthritis is that as one joint improves another is liable to become painful. In 1947 the back of my head, my neck, jaw, and right shoulder, and my back below the shoulder-blade, began to give trouble especially at night. If I sat up in bed the pain was bearable, but if I slipped down during my sleep I woke with an agonising headache. The pain was unbearable if I lay on my side; so I found it more comfortable to spend the night sitting in an armchair. X-ray examination showed arthritis in the neck vertebræ, and I was given a stiff collar to wear, especially at night. It certainly prevented the headache to some extent; but the pains in my arms, hands, and feet began to get worse. Writing became more difficult, and it was almost impossible to dress myself or cut up my food. Yet I felt I must do these things for myself as far as possible, or I would become useless.

The mornings were my worst times, and I felt quite helpless on waking: I could not take a bath without help, or brush my hair or pour out tea, or spread butter on toast. I would try to move about, and would put my hands in warm water; and then, in about half an

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hour, I would be able to do things in spite of the pain.

In May, 1948, I went to Switzerland for spa treatment, and was given sulphur baths and Fango baths, but found them more tiring than helpful. After about 4 weeks I went to the mountains to get braced before going home. The lovely snow, air, and sunshine did make me feel stronger; and after about 11 o'clock in the morning I began to take short walks and to go about a little more. When I returned to London, however, my hands were as bad as before, and I had much pain in my back. The nights were a misery. My doctor therefore ordered me a shoulder and neck splint which supports me back and front, and which I wear day and night. At first it was very hard and uncomfortable, and again I had to sleep sitting up in an armchair; but it makes the pain easier. Indeed, when I went into hospital recently to have two toes removed, leaving my splint behind, I was quite lost without the wretched thing. It certainly keeps my back and head from hurting. It is difficult to wear out-of-doors, especially when getting on and off a bus. I take it off for 3 hours in the evening, so as to prevent the muscles from getting too stiff.

I have not been so intimate with arthritis for 8 years without learning a few ways of managing it. I take rather a professional interest in it, for I was a masseuse in the first world war, and for many years afterwards; and for a time I helped to run a rheumatic clinic. Aspirin is my great ally, the best of all the drugs I have tried. I take two 5-grain tablets every 3 hours, in hot water or a hot drink; and I eat something (even if it is only a biscuit) at the same time because that seems to make the aspirin work more quickly. I don't feel life would be bearable without this. Regular 3-hourly doses keep the pain down, but if I am out, and cannot take the next dose to time, the pain becomes severe in head and back, and is not eased for quite an hour after taking aspirin.

I find it best to use several hard pillows in bed, and the top one needs to be specially firm to keep my head from falling into a painful position. I use five pillows—three soft, with two hard ones on top—and I have an additional small hard pillow under my right shoulder. The splint keeps me from slipping round on to my side. It is important, I find, to have the splint firmly fixed next the skin before going to bed, for if it slips it seems to press on a nerve, giving me pain in the ear and jaw.

It seems essential, in the daytime, to keep moving, and not to give in to the pains, especially in the early morning when all I want in life is to stay in bed. Then is the time to struggle out; and indeed even on a good day the struggle is fierce and difficult—but well worth it.

I have a fairly good method of getting into and out of a bath: I bend down and lean my forearms on the sides before putting a foot in. Getting out is always difficult, and worse than ever with two toes missing. In walking I am able to "take to my heels," but somehow I haven't learned to get up on my heels in my bath. It always hurts, too, to get on and off a 'bus, partly because I have so little grip in my hands.

There are days, however, after a really painful night, when no amount of will-power can make one feel better. On those days I sit in an armchair and, if I can hold a book, try to read; I see nobody, and do no work in the flat, for I cannot use my hands, even to write. I try (not always successfully) to say over and over again how fortunate I am, and how much worse many others are. On such days I increase the dose of aspirin, and just wait. Later in the day I try to move about the flat, which I share with a young keen woman of 85, and we discuss plans for our many interests. These are more varied than might be supposed. I used to be on the committees of several voluntary societies, but getting to and fro has become too difficult, though I still try to attend some of their meetings. My special interest now is in a small home near London for unwanted children, one of whom I have adopted as a "godchild." When I can, I go there and help the matron with the difficult children, and she tells me I am useful. I get a friend to motor me down to see them, if possible every month, and oftener in their school holidays. The old friend who shares my flat has become the official grandmother of the home and the children sometimes come and spend a day with us. We have many friends who visit us, and on good days I can manage to get the tea ready and do a fair share in the flat. From a busy person's point of view I suppose I am useless, but I seem always to be doing something, and my days are not nearly long enough. My hand does not like to use a pen, but I manage to write several letters every week to young people abroad in whom I have taken an interest in the past, and I have never known what it is to be lonely or dull. The great thing is to keep on working through the pain: it does so pay in the end.

Public Health

SEA AND AIR PORT HYGIENE

CONFERENCE AT NEWPORT

AT the annual conference of the Association of Sea and Air Port Health Authorities, held at Newport, Mon., on April 27–29, a paper on the Fats Problem was read by Dr. STUART LAIDLAW.

Throughout two world wars, he said, and for some time after each, the people of Britain have been conscious of a fat shortage, and chemists all over the world have tried to produce a synthetic substitute. The first chemists to report the manufacture of a synthetic product were Germans, who in 1939 obtained from fatty acids in synthetically prepared hydrocarbon oil a substance they named 'Prima' margarine.

The present acute world shortage, said to amount to $4^1/_2$ million tons, may be attributed mainly to excessive slaughter of farm animals and increase in world population. Britain produces only 10% of her requirements. The food value of fats is great because of their high calorie value, and because they aid the utilisation of other foods and often carry vitamins A and D.

Many substitutes have appeared on the market in the form of emulsifiers and greasing compounds. There have been reports of 'Vaseline' being used by bakers, of processed motor oil being used as frying oils, and of reconstituted fatty acids being obtained from ethylene glycol (an anti-freeze mixture) and aluminium stearate (for greasing aeroplanes). Many housewives have been using liquid paraffin as an emulsifier in baking. The use of mineral oils for such purposes should be condemned, for they have no nutritional value, contain no vitamins, and interfere with the absorption of carotene and vitamin A, calcium, phosphorus, and vitamin K obtained from other sources; and possibly they have carcinogenetic properties.

Chemical analysis and bacteriological examination of samples of some of the chemically produced substances arriving at the port of Glasgow showed them to be of doubtful origin and bacteriologically unsatisfactory. Obviously they were prepared from fatty acids; and public-health authorities should establish whether the fatty acids used are obtained from edible or inedible fats. Normally inedible fats are imported for such purposes as soap-making, but there is no effective legislation to prevent the fatty acids obtained from splitting inedible fats being reconstituted for use in the manufacture of food. A recent Order prohibits the use of mineral oil as an ingredient in food; but, said Dr. Laidlaw, the use of all inedible fats should be controlled.

Two other sources of fat are whales and the vegetable kingdom. The vegetable supply does not present any difficulty; but the supply obtained from whales may, in view of the impending legislation which will raise the problem of the use to which whale-oil derived from condemned carcasses may be put.

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WATER AND FOOD SUPPLIES ON AIR ROUTES

Discussing the control of water and food supplies on air routes, Air Marshal Sir HAROLD WHITTINGHAM outlined the measures taken by the British Overseas Airways Corporation, whose medical services he directs. To prevent food infection, deep-freezing stations have been established to supply all routes with pre-cooked, deep-frozen foods, which have been hygienically prepared and packed before freezing and are held frozen at staging-posts or in aircraft until needed, when they are thawed and reheated in thermostatically controlled ovens to a high temperature (350°F) before serving; special precautions are taken against dehydration. The high and low temperatures attained in this cooking, deep-freezing, and reheating ensure that all pathogenic germs, and their spores and toxins, are destroyed. Moreover, the form of wrapping used prevents contamination once the food has been cooked. In this way, bacteriologically pure and wholesome food, with its full nourishment and flavour and natural colour, is served either hot or cold, as appropriate, at any time, whether on the ground or in the air.

Great care is given to the construction and operation of kitchens and canteens on the ground, and of the steward's pantry in aircraft, including the cleansing of crockery and cutlery. This procedure, together with careful selection and examination of all food-handlers—caterers, cooks, kitchen staff, stewards, stewardesses, and waitresses—and their instruction in the hygienic handling and preparation of food and water, ensures a very high standard of catering.

PORT HEALTH AND ALLIED SERVICES

Dr. T. L. J. COXON, reviewing the work of the port health authorities in relation to other services, advocated the abolition of detailed medical inspection of aliens, except for those coming to take up domestic service and who are likely to be closely associated with children in this country. In place of the existing procedure, he recommended that before leaving their own country the aliens should be medically examined and provided with a medical certificate, countersigned by the British Consul, which could be produced on arrival.

l'Oeuvre Grancher

Tuberculosis has to be fought in many different ways. One of the most instructive parts of the French campaign against the disease is l'Oeuvre Grancher, founded by Professor Grancher in 1904. The following account is based on information supplied by Dr. P.-F. Armand-Delille, the secretary-general, to Dr. Thomas Stapleton, of the department of child health at Sheffield.

The object of the movement is to remove, if possible at birth, the infants born of parents with open tuberculosis, and board them out in the homes of peasants in the country, either until the source of infection is eradicated or until the child is 14 years old. This work depended at first on voluntary subscriptions, but it has proved so successful that the organisation is now reimbursed from governmental and departmental funds. Instead of only a few children being helped in this way, there are now 6500 in peasant families: the duration of stay is variable, but about a quarter to a third of the total boarders are new each year. The foster-parents are at present paid 4000 francs a month (about £1 a week) and their homes are inspected by a doctor and a visiting nurse. The beneficial effects of this control are shown in the following figures given by Dr. Armand-Delille:

—	Children remaining with contagious parents	Children boarded out by l'Oeuvre Grancher
Remaining free of clinical tuberculosis	40%	99·69%
"Curable" tuberculosis..	20%	0·3%
Mortality	40%	0·01%

Each group based on the observation of 4000 children.

An interesting sidelight is that, though the children who come from tuberculous homes are, wherever possible, vaccinated with B.C.G. as soon as they have regained their birth-weight, it is still thought advisable to remove them for several years from the risk of gross infection. A commendable caution is evident among some of the B.C.G. users; in l'Oeuvre Grancher, cutaneous tuberculin tests are repeated every year, and if the Mantoux reaction becomes negative the child is revaccinated at the ages of 3 and 7, and sometimes later.

One might expect a high incidence of bovine tuberculosis in these rural children. The almost complete absence of this type of infection seems to be due rather to the universal custom of boiling the milk in the country (because of the risk of typhoid and dysentery) than to absence of the disease among cattle.

The great increase in the numbers of children boarded out under the scheme reflects much credit to those who have carried on the work of its founder.

Smallpox

The last of the 11 cases of smallpox imported on s.s. *Mooltan* was removed to hospital on April 16. The period of surveillance of the numerous contacts with these cases has now expired without notification of the disease in any of them. There is reason to hope that the infection has not passed to anyone in this country, but the possibility of a missed case cannot yet be excluded, because at least one of the patients may have been in contact with persons who could not be brought under surveillance. Special vigilance for smallpox should therefore continue for a further 2–3 weeks.

Fortunately the passengers and crew of s.s. *Mooltan* gave the public-health authorities helpful coöperation. The patients who developed the disease were removed early and before they could do much damage. With very few exceptions contacts accepted vaccination promptly and remained under surveillance. The several public-health departments involved, particularly those for the ten districts in which the imported cases sickened, appear to have carried out the routine measures for the control of smallpox without a hitch and can congratulate themselves upon the particularly satisfactory result.

The patients who survived are now making satisfactory progress. The case-fatality—6 out of 12—is unlikely to alter. In 2 patients, modification by previous vaccination reduced the disease to a triviality, beyond the point where confident diagnosis was possible; variola virus was, however, recovered on egg-culture. Virus was also recovered from the other cases except that at Liverpool.

Typhoid Fever in Berkshire

On April 30 typhoid fever was confirmed in a patient admitted to the Royal Berkshire Hospital from Crowthorne (population 3500). During the next two days the diagnosis was confirmed in 4 other patients, and a total of 32 people were suspected of suffering from the disease. The earliest of the dates of onset so far mentioned is April 21. The usual steps have been taken to bring the outbreak under control. An outbreak of considerable magnitude is to be expected; and until the source and vehicle have been identified, it cannot be assumed that the disease will remain confined to Crowthorne. The *Salmonella typhi* is of Vi-phage type E_1.

Crowthorne is at the junction of the territory of three regional hospital boards—North-West Metropolitan, South-West Metropolitan, and Oxford. Cases are known to have been admitted to hospital at Winchester.

Diphtheria Immunisation Campaign

Last year the number of children under five years of age who were immunised against diphtheria was about 575,000—60,000 short of the objective. In a letter to local authorities the Ministry of Health points out that "there is still an insistent need to lessen the gap between aim and achievement, if the risk of rising figures of notifications and deaths in later years is to be overcome." Last year deaths, totalling 150, and cases, totalling 8034, were the fewest ever recorded. In the ten-year period 1931–40 the yearly average of deaths was 2800 and of cases 55,000.

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In England Now

A Running Commentary by Peripatetic Correspondents

"COULD you keep it medical?" asked the Editor pointedly, as I set out for the Royal Academy. What a spirit in which to view art! But I sat down and went conscientiously through the catalogue before raising my eyes to the walls. It was a small bag, and would have been a good deal smaller but for the beneficent exertions of Dr. Henry Lamb. For "Sir Alexander Fleming" in the soft yellow taffeta and scarlet of his gown I have to thank T. C. Dugdale. Then there was "Portrait of a Doctor," among the miniatures, by Josephine A. Dyer—he was one of the old school with thinning hair, a walrus moustache, and his bow-tie crooked; I liked him on sight. Kenneth H. Oliver had etched a couple of medical students at their books, with a skull between them on the table; and very like the boys they were, slouched in absorbed reading. "Dr. Butler's" by John C. Anderson turned out obscurely to be a brown old shop-front; and "R. H. Butler, Esq.," by David Jagger, looked like the missing doctor but was ruthlessly clutching a blueprint.

Well then, what about other medical interests? Wounds, public health, pathology? I reluctantly decided that spot diagnosis among the portraits would only cause unpleasantness. Joan Haussall's "Launcelot Hurt in the Forest," though nice enough in its way, proved to be too small for clinical assessment; "Mount Vernon" turned out not to be the hospital; and "Skull in Landscape" only belonged to a sheep. "At Midhurst," by Adrian Hill, made my heart beat fast: the founder of art therapy should do justice to such a subject. But it seemed that Mr. Hill had been moved to creation by the sight of a couple of dustbins in a green shade; perhaps round the back of the sanatorium? Carel Weight's "He put her in an Acid Bath, Miss," promised well, but proved to be a Daily, gossiping. I thought the hanging committee had missed their big chance when they failed to put this picture next to "Studio Bath" by Charles J. Johnson; the body was disintegrating nicely in what appeared to be vitriol. "Keats' House, Hampstead," by J. Newton, could claim a medical connexion. It was a toy-bright exact picture painted on such a sullen day that the brilliant crowding trees seem threatening. I hoped for some interesting casualties from Alan Sorrell's "Beset by Bandits" and found myself in a country of grottoes and cascades, lifted straight from Mrs. Radcliffe, where a tiny coach withstood the fusillade of highwaymen. A line engraving of a frog by Charles H. A. Chaplin did charming justice to a creature which looms so large at one stage of a medical career.

Returning gratefully to my Lambs, I enjoyed the blues, greys, and greenish-browns of "Felicia," a schoolgirl reading, and his portraits of no less than three Fabers. "*That's* Kingsley Martin," said my colleague as we left through the sculpture. "It's not like him," I demurred. "More like him than that—or that—or that," she said tartly, indicating in rapid succession a Scottish fishwife, the head of a boxer, and one of Douglas Wain-Hobson's terra-cotta figures. "Or these," I agreed, pausing before two females kneeling in his neighbourhood. "Oh those!" she said fleetingly, "those are his contributors."

* * *

When I go into chemists' shops where I am known, I always enjoy the embarrassed look of the chemist if he is in the middle of a quiet consultation with a customer over the counter. The customer is generally, in my experience, an elderly man with a husky voice. One would expect this kind of thing to die out now that there is a comprehensive health service, but there are still those who prefer any advice to the doctor's.

Not long ago I was standing near the drugs counter in a well-known chain store, at a seaside town which is packed with G.P.s, when I became aware of a one-sided conversation at my elbow. A youngish woman of "suburban" type was begging the girl behind the counter to give her something for her little boy. "It hurts him here every time he coughs," she said, putting her hand on her umbilicus. "He's only had it three days, but it hurts *here*. I just want something to stop the cough." The sales girl was aghast. It was painfully obvious that normally her only contact with the world of medicine was handing out labelled preparations in return for cash. She looked wildly round for help. "It couldn't be anything strong at that age," she said to gain time. (I had missed hearing the boy's age.) Out of the corner of my eye I had noticed an elderly man at the dispensing alcove who would no doubt come to the rescue, so I rejected the notion of mentioning the N.H.S., collected my parcel, and departed. I don't suppose the child came to any harm—children seldom do.

Why do people do these things? Sometimes because they are afraid the doctor will find something unpleasant, or just because they "don't like doctors"; but more often, I think, because it is much more trouble to consult the doctor—even if they can persuade him to call—than the white-coated lady behind the counter.

* * *

Whatever views you may hold on our brothers from the Dominions, however queer you may think the uncouth colonial, please, *please* don't air your opinions in medical documents destined for overseas reading. I work in a hospital in Canada, and today we received a report on a patient who had spent some time in an English psychiatric ward. It remarked that: "the patient frequently had periods of bizarre behaviour which can probably be accounted for by the fact that he is a Canadian." Thank goodness my colleagues have a sense of humour. There was nothing bizarre about the gale of laughter which greeted this unhappy phrase.

* * *

Of 162 consecutive applicants for admission to a provincial medical school, 93 (57%) said at the preliminary interview that after qualification they wished to specialise. Of these, 37 wanted to specialise in surgery, mostly because their interest had been aroused by dissection in biology, or because they had had an operation themselves; 12 wanted to be psychiatrists—most of them, one felt, in the hopes of solving their own psychological problems, but one of them gave as his reason the conviction that in future all such interviews would be conducted by psychiatrists. (He was rejected.) Another 9 were going to be specialists in anything—they didn't care what. Of the rest 8 chose pædiatrics, 6 obstetrics, 3 eyes. Radiology had 2 aspirants, and so had dermatology, plastic surgery, gynæcology, bacteriology, and general medicine. (Perhaps the others had not heard of specialist physicians). Only 1 chose biochemistry, biology, pathology, physiology, poliomyelitis, and otorhinolaryngology. A wise 33 (20%) did not know what they would do when they qualified. A mere 19 (12%) opted for general practice; 6 were going into research—any sort of research—4 wanted to be missionaries, 3 medical officers of health, 1 a school medical officer, 1 a police surgeon, 1 an industrial medical officer, and 1 was going to see the world as ship's surgeon. No-one wanted to see the world in the Navy, Air Force, or Army. No-one had chosen medical politics.

It is to be hoped that many will change their minds.

* * *

I will arise and go now, and go to surgery,
For a great gathering waits there, to taste my bottled joys;
Nine keen rows will I find there, and while I work like a bee
The telephone makes a bee-loud noise.

And I shall find no peace there, for peace is devilish rare,
Devilish rare in the morning, when life is Full of Things,
And midnight's not much better, and noon's a ruddy affair,
And evenings the night bell rings.

I will arise and go now, for always by night and day
There'll sure be someone yapping with low sounds at the door,
When I totter up the pathway, looking and feeling grey,
I've been through it all before.

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Letters to the Editor

FREE "BED AND BOARD" IN HOSPITALS

SIR,—May a lay reader of THE LANCET, who is trying to study the course of our National Health Service, propose one important amendment in that service, which would be good in itself and would save a lot of money for vital improvements on the medical side? Why not abandon the lavish offer of free board and lodging for patients in all transferred hospitals and institutions? This is surely a needless extravagance so long as it is lack of money that obstructs the provision of more hospital beds and the full use of the skilled medical and nursing staffs available. There may well be other economies on the administrative side which should be insisted upon at this vital stage, but I do not presume to know enough to specify them here.

I suggest that to impose a standard weekly charge for "hotel expenses" (Beveridge's words) offers the largest opening for economy, possibly amounting to £20–30 million a year, and would still be consistent with a free *medical* service. Abatements of charge down to nothing, and assessments according to need by experienced almoners or assessors, would of course be a basic feature of the plan.

Be it noted that the Beveridge report, on which our new Health and Insurance Acts purport to be based, did not contemplate free "hotel expenses," but talked of payment either direct or by contributory methods: "It may be expedient to make a charge, if only to avoid making it appear profitable to the patient to stay in hospital when he could go home" (para 434). The bearing of this remark on today's policy of a more rapid turnover of beds needs no stress, and the good moral effect of a charge would, I believe, spread much wider than this. It is needed at the present time on moral grounds alone and would be far better than the threatened special tax of Sir Stafford Cripps.

Surely, Sir, this principle of a charge for board and lodging fits in, too, with:

(*a*) The previous practice of our voluntary hospitals and the continuing practice of certain other social services.

(*b*) The charges now permitted, even under the N.H.S., for extra comforts—e.g., private rooms.

(*c*) The payment to insured patients, while in hospital, of sick benefits at the rate of 26*s*. single and 42*s*. married.

Here I venture to insert some figures from the Civil Estimates as a reminder of the sensational finances of the N.H.S.:

COSTS OF N.H.S. ENGLAND AND WALES

Original official estimate (1948–49)	£132,000,000
Actual cost of services (1948–49) (nine months) ..	£185,000,000
Plus appropriations in aid	£62,000,000
Total cost	£247,000,000
Estimates for 1949–50	£228,000,000
Plus appropriations in aid	£84,000,000
Total estimated cost ..	£312,000,000

Of this total of £312 million, hospitals, specialist, and related services account for £177 million, or well over half the total, although the facilities for such treatment are still far from adequate to meet demands and must urgently be increased. It is this item of the N.H.S. account which is chiefly embarrassing the Government.

Finally, here is an amateur estimate as to how far the Government might relieve their financial embarrassment by adopting the policy of a standard charge for "hotel expenses" in hospitals, &c.

Assume 500,000 beds in 3500 transferred institutions. Allow for gaps and vacant beds and assume an average of 400,000 occupied-bed weeks throughout the year. This, multiplied by 52 equals 20,800,000 occupied-bed weeks per annum. Assume a standard charge of £2 per week for "hotel expenses," meaning accommodation, food and service. This would give a maximum theoretical income of £41,600,000 per annum. In actual operation, allow for 25% of cases assessed free, plus another 25% averaging half the standard payment, = a reduction of about £15 million on the maximum income = an estimated income of £26 million per year. Such saving of £26 million (or 15% of the £177 million allowed for hospitals and associated services) might go a long way to promote a more rapid extension in the medical facilities and staffs available to the public.

Shiplake, Oxon. RONALD DAVISON.

TRAINEE SPECIALISTS' ASSOCIATION

SIR,—It is becoming apparent from the numbers of trainee specialists' groups springing up all over the country, that doctors in this category are aware of their present uncoördinated, unrepresented position, and are realising that unless they help themselves no-one else will.

At present the grading of posts, and of trainee specialists themselves, is going on without the methods and criteria by which these things are done being either uniform or public. Nor are trainee specialists themselves having any say in the matter except in the few areas where they are represented upon the medical advisory committees of their hospitals. It is high time therefore for trainee specialists to organise themselves on a national basis, so that their opinions may carry weight, and that they may obtain the representation on medical committees in the National Health Service which their numbers and responsibilities justify.

It seems necessary to me that trainee specialists' groups should be formed as soon as possible in every region, and I would be glad if anyone in this category wishing to form one for this region would get in touch with me.

20, Norham Gardens, Oxford. H. A. W. FORBES.

SIR,—In the North-West Metropolitan region a trainee specialists' association has been formed with the object of furthering the professional interests and well-being of trainee specialists. The next meeting will be held in the board room of Charing Cross Hospital on Monday, May 9, at 5 P.M.; and it is hoped that all hospitals in the region will send representatives.

West Middlesex County Hospital, Isleworth. A. B. BACKUS Chairman, Working Party.

ŒSOPHAGEAL LESIONS IN SCLERODACTYLY

SIR,—The title of my article of March 5 was chosen to imply something different from sclerodermatous lesions in the œsophagus, but Mr. Allison's suggestion last week that these lesions are invariably peptic cannot be accepted without question.

I quoted an earlier paper of Mr. Allison and suggested that inflammatory changes might play a part in producing the deformity. The largest series of cases with scleroderma I know in which œsophageal function was investigated was at the Mayo Clinic, where 10% of patients complained of pain or more commonly dysphagia; this is surely a high proportion of any population to have peptic ulcer of the œsophagus. Mr. Allison mentions the tracing of my first case as a characteristic example of peptic ulceration with hernia and œsophagitis; in this case there was achlorhydria after histamine, and I cannot agree that peptic activity is a likely explanation. In my second case, in which the tracing is not like that ever seen in cardiospasm, the patient had for seven years attended a London teaching hospital for treatment of cardiospasm by dilation, and is no doubt still so indexed.

My article was a short abstract of a talk, and its emphasis shifted with its shortening. If the working of the cardia is disturbed, regurgitation may quite well happen; a moderately stiff heart-valve will allow regurgitation at the same time that it produces obstruction. The presence of a peptic ulcer is no proof at all that there is no sclerodermatous lesion as well. Nor does the difficulty of demonstrating sclerodermatous change prove that it is absent; the fingers in sclerodactyly may not show it, and frequently do not, although there is no doubt of its presence elsewhere. I suggest that the œsophagitis in sclerodermia is very similar to the ulceration at the finger-tips in some cases. I find it difficult to think that œsophageal deformity is due to peptic ulcer of the œsophagus occurring quite by chance

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in a patient with sclerodermia, just as I find it difficult to think that sclerodactyly is due to the chance occurrence of Raynaud's phenomenon in such a patient. One case indeed has been published in which the œsophagus was calcified, and I doubt if Mr. Allison has had one of those in his series of peptic ulcers. If this one case must be admitted, then the immunity which Mr. Allision claims for the œsophagus from lesions which have been demonstrated in the heart and lung, and the rest of the intestinal tract, is not absolute. I said such lesions are rare, but they do occur, sometimes with remarkable rapidity, as in the case operated on by Prof. Grey Turner; and they are worth remembering, because the prognosis is rather better than with cancer, which they can simulate, and sometimes because it is rather worse than with cardiospasm or peptic ulcer pure and simple.

There seem to me to be three possibilities: (*a*) lesions due entirely to sclerodermia; (*b*) lesions due to entirely fortuitous coincidental peptic lesions; and (*c*) peptic lesions conditioned by regurgitation due in some way to sclerodermatous change. I think the third most likely, and then the first. And I think that one of these days Mr. Allison will think the same.

Hove, Sussex. W. A. BOURNE.

SENSITIVITY OF TUBERCLE BACILLUS

SIR,—Intensive treatment of tuberculosis with antibiotics and chemotherapeutic agents calls for in-vitro resistance tests. Owing to the slow growth of the tubercle bacillus it has been impossible to obtain results quickly, but the introduction of Pryce's [1] slide-culture method has significantly improved the position. I have used this method in studying the bacteriostatic effect of *p*-aminosalicylic acid (P.A.S.),[2] and can confirm Lehmann's [3] findings.

I have found Pryce's technique suitable as a routine method of determining the effect of P.A.S. and of streptomycin on the growth of tubercle bacilli. One of the advantages of this slide-culture method is that it enables one to determine resistance directly on the original material without previous culture, which means that results may be obtained within a week. The only requirement is that the material shall contain enough tubercle bacilli for all slides—usually 12—to get an adequate number of viable bacilli. Should the quantity of bacilli be insufficient, the absence of growth might be wrongly attributed to a P.A.S. or streptomycin effect. This quick method may be applied to practically any material. In addition to sputum, I have experimented with cultures of tubercle bacilli from Löwenstein's, Dubos's, and Sauton's media, and from minced guinea-pig glands. The technique was as follows:

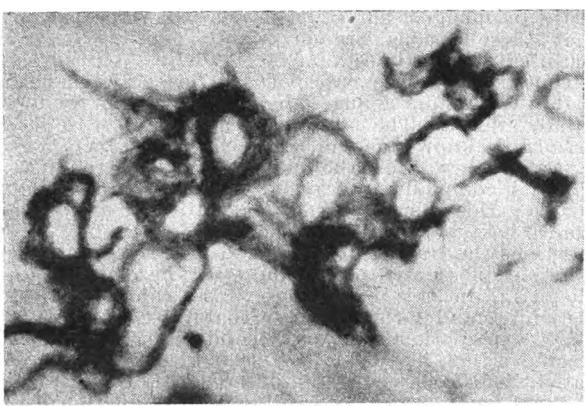

Fig. 1—Myceliform growths after 10 days' cultivation in medium containing 0·0015 mg. P.A.S. per 100 ml.

If the material consisted of sputum or glandular tissue I prepared smears. If, on the other hand, it consisted of a bacterial culture, this was dispersed in a mixture of 1 part of horse plasma and 6 parts of physiological saline. This bacterial solution was allowed to stand for some hours before films were made from the supernatant fluid. When the slides had dried in air they were immersed in 6% sulphuric acid for 5–15 min.—fresh Dubos and Sauton cultures for at most 5 min., Löwenstein cultures for about 10 min., and sputum and glandular tissue for 12–15 min. depending on the thickness of the sections. The slides were rinsed twice under sterile conditions in two separate Petri dishes containing distilled water. Then they were immersed in the medium (1 part defibrinised horse blood plus 2 parts sterile distilled water) which was contained in 80 × 30 mm. culture tubes with plugs made of cotton-wool wrapped in bandage gauze. The medium was about the same as that used by Müller.[4] The P.A.S. concentrations were 15, 1·5, 0·15, 0·015, and 0·0015 mg. per 100 ml. (corresponding to 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}, and 10^{-7} mol.). The P.A.S.-medium mixtures were prepared by adding 0·1 ml. of an 0·1 molar neutral P.A.S. solution to 10 ml. of the medium. Of this stock mixture (15 mg. per 100 ml.), 1 ml. was transferred to 9 ml. of medium (= 1·5 mg. per 100 ml.), and so on in decreasing concentrations. Naturally the various concentrations could also have been made up by successively diluting the 0·1 molar P.A.S. solution 10 times and adding 0·1 ml. of each dilution to 10 ml. of medium. The 0·1 molar P.A.S. solution was made up by dissolving 211 mg. sodium dihydroxy para-aminosalicylic acid in 10 ml. of water and autoclaving the solution or, better, filtering it through a Seitz filter. This stock solution is stable for at least one week when kept in a refrigerator. Double series were made of each concentration as well as of the controls.

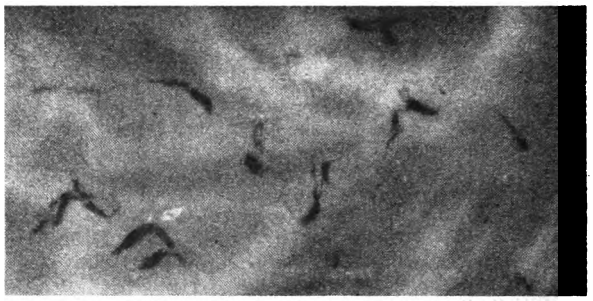

Fig. 2—Initial growth in medium containing 1·5 mg. P.A.S. per 100 ml.

After 7 days' growth at 37°C one of the controls was stained and observed microscopically, and if it exhibited plentiful growth (myceliform, branched formations) all the slides were stained and examined. If the control exhibited no or little growth, the cultures were incubated for another 7 days. As a rule Hallberg's [5] staining procedure was employed, but sometimes Ziehl-Neelsen's. Decolorising must be performed very carefully and rapidly, for the young bacilli are not as resistant to acids as are bacilli which have grown for longer periods on other media. The after-staining with the contrast dye must be very brief, or, possibly, excluded.

With the generally observed susceptibility to P.A.S. there may be seen plentiful formations of myceliform growths—such as are described by Pryce—in the concentrations of 0·0015 and perhaps also of 0·015 mg. per 100 ml. (see fig. 1). Slides that have been submerged in media with higher P.A.S. concentrations exhibit no typical accumulations of bacilli; but these may be longer than usual, unevenly stained, and perhaps branched (branching forms according to Pryce). In my experience such microscopical pictures are common in experiments with sputum or glandular tissue. In experiments with bacteria from Dubos's, Sauton's, or Löwenstein's medium the same results will be obtained as regards the susceptibility to P.A.S., but slides from media with concentrations higher than 0·015 mg. per 100 ml. often exhibit another picture. In this case there may be seen small typical "colonies" similar to the forms observed by Pryce [1] after 6 days' cultivation of sputum slides (fig. 2). This typical accumulation of bacteria—which is never seen on non-incubated slides—is apparently due to an initial growth of the bacilli. Thus Dubos cultures with their rapid growth often give rise to these forms. In estimating the susceptibility to P.A.S. of a bacterial strain it is of great importance that the small colonies discussed above do not continue growth during

1. Pryce, D. M. *J. Path. Bact.* 1941, **53**, 327.
2. Sievers, O. *Svenska Läkartidn.* 1946, **33**, 2041.
3. Lehmann, J. *Lancet*, 1946, i, 14; *Svenska Läkartidn.* 1946, **33**, 2039.
4. Müller, H. *J. Path. Bact.* 1944, **56**, 429.
5. Hallberg, V. *Acta med. scand.* 1946, suppl. 180.

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prolonged incubation when they have been subjected to P.A.S. concentrations higher than 0·015 mg. per 100 ml. so that the characteristic myceliform forms never arise. I have interpreted this phenomenon as a sign that there is an initial growth which ceases after some days owing to the bacteriostatic effect of P.A.S. The greater the growth-rate of the bacilli, the greater will be the initial growth before P.A.S. has time to exert its inhibiting effect. The fact that P.A.S. does not immediately affect the growth with Pryce's slide-culture method agrees with the findings of Lehmann,[3] who seldom obtained more than 90–95% inhibition in experiments with Sauton cultures despite high P.A.S. concentrations.

So far I have not observed any consistent resistance to P.A.S. in my experiments with numerous samples from patients treated with this substance. In no case was there any growth in a concentration of 1·5 mg. P.A.S. per 100 ml., and consequently, since in ordinary P.A.S. therapy the blood concentration usually lies between 2 and 6 mg. per 100 ml., resistance of clinical importance has not been observed.

Bacteriological Laboratory, Sahlgren's Hospital, Gothenburg, Sweden. OLOF SIEVERS.

RISK FROM ASPIRIN PREPARATION

SIR,—In recent years an aspirin preparation has been introduced to the English market from across the Atlantic of which the novelty is that it can be "eaten like a sweet." Have the makers carefully considered how easy it would be for an infant exploring the cupboards to eat these tablets "just like sweets"? Who has not rescued his own children just in time from such a happening? A warning on the package, and the wrapping of all tablets of this type in transparent paper of a distinctive colour never used for sweets, might help to counter the risk.

Newcastle-on-Tyne. A. FORSTER.

RETROPUBIC PROSTATECTOMY

SIR,—I am not surprised that Mr. Millin and Mr. Macalister (April 23) do not always advise operation for prostatic enlargement with minimal symptoms. I am very surprised indeed that they describe this view as "commonplace knowledge." Examination of the appropriate chapters of 8 standard textbooks of general surgery showed that 5 make no mention of expectant treatment, describe the condition as progressive, and give the impression that the prostate which is enlarged should be removed if the patient's condition is good enough.

This is a matter of great importance and one which cannot be put aside lightly. An enormous proportion of men over fifty-five have some enlargement of the prostate, and of these a considerable number have mild urinary symptoms which continue to the end of their lives without any effect on their health. These symptoms are often regarded as a natural result of age, and in the past such patients did not seek medical advice. I believe that this is the reason why so many writers describe as exceptional the non-progressive case of prostatic enlargement. With spreading knowledge, more and more patients with mild symptoms now consult surgeons. This is much to be encouraged and gives hope that a larger number of progressive cases will be treated at an earlier stage. It would be wrong if all of these mild cases were treated by operation, and I think that the article of March 5 by Mr. Millin and his colleagues might be interpreted as encouragement to do so. This impression could be corrected from Mr. Millin's writings elsewhere, but there are many surgeons who remove prostates but who do not study the specialist literature of urology.

My experience of the expectant treatment of prostatic cases has justified fully the continued use of the residual-urine test, though my dependence on it has been exaggerated by your correspondents. No surgeon would refuse to help a distressed patient because his case did not fulfil precise criteria. A more difficult decision must be made when a patient seeks advice about symptoms which are merely a minor inconvenience. Such a patient is concerned, not about the present, but about the future. He is fit; his prostate is enlarged. Should he have an operation? It is in this type of case that I believe the residual-urine test to be of great value. Surely a prostate which prevents the bladder from emptying must be more dangerous than one which is less obstructive. I have been aware for a long time that a prostate might affect the upper urinary tract without producing residual urine, but have found little evidence of this in my own practice. I think that such cases must be exceptional and need not affect our general indications for operation.

Glasgow. T. L. CHAPMAN.

THE MEDICAL ILLUSTRATOR

SIR,—I protest against education through terror as depicted in fig. 2 of the article by the senior medical illustrator of Guy's Hospital in your issue of April 23. This is wrong whether the education be general, health, or medical. It belongs to the time of Hieronymus Bosch and later of Heilige Breughel with their representations of what may happen to us in Hell. It is not absent from the woodcuts of Albrecht Dürer, who was contemporary with the former. It savours of nursemaid discipline with the frightening of her charges first with Boney, then with Bogy, and finally with a Bobby. All this is now a thing of the past. Rule by frightening the instructed is not in the spirit of our time and never was of England. Our artists have never used their powers to compel us to the will of those that would rule us; nor will the illustrator to Guy's find any evidence of it in the work of her predecessor, Joseph Towne, although he could depict emotion when he needed it, as may be seen in the first of the three wax models of the huge aortic aneurysm in which there is a depiction of agonising pain with the "drawn expression" of tense, half-contracted muscles of the whole face that vies with any other example of the sculptor's art.

This wrong use of her art is of the greater moment because the illustrator to Guy's has a great power of representing emotion in a few lines. Witness this picture with the variation in each of the four ages, although we may doubt whether the infant has yet an intelligence that will appreciate the meaning of death or its symbolism in a clothed skeleton. Give it a human femur and it will find it as excellent a drumstick as that of a Moa if there is a dustbin lid lying about ready for it to beat.

Fig. 1 is in the right spirit. There is no doubt that that child has "whoopers," and the calmness of the little nurse-mother is just what is needed under the circumstances. This is so truly England that the original might even be purchased by the Chantrey trustees, leaving the weeping *Widow of the Cross-Roads*, with its French influence, which public opinion compelled the Ministry of Transport to withdraw, to those of the Tate.

Education by terror is a part of a trend that is but too evident today. Some years ago I gave a clinical lecture on Appointment with Fear, dealing with signatures for anæsthetics, for refusal to accept a doctor's advice, and for leaving hospital, all of which I used to forbid my house-surgeon ever to use. I am glad therefore that it is one working at my own hospital that has enabled me to raise this point. To do so with reference to any other might savour of bad form. It was the late Dr. E. W. Goodall that first put this conception of criticism, without condemnation, into my head. He used to show to his D.P.H. class plans of the medical wards in Hunt's house at Guy's, with their four rows of beds between the cross-ventilation of the windows, as an example of how *not* to build a hospital. He told me that he was glad they came from his own hospital; he would have some diffidence in speaking about them with the emphasis, that was a part of his nature, had they been at any other. And so here. The last paragraph of this paper shows that it is a matter of Guy's not of its senior illustrator. It is a question of the Code of the Herd. In the first instance of the little Herd of Guy's; but I much suspect, also of that larger Herd, of which this is but a small part, and which involves all the teaching schools at least in London.

Fifty years ago the direction of the code of the herd at a teaching hospital was in the hands of the individual members of the staff. This began to change when the members increased to such an extent that no man had

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his own ward entirely to himself and his assistant. He was no longer in the position of the captain in his ship. He could no longer lay down rules which were implicitly obeyed. Today his position is taken by a committee. The code of the herd depends upon this. Like it or not, we have passed into an age of committee rule. Now my experience is that the code of the committee approximates to that held by the member with the lowest, rather than to that of the many, or of the man with the outstandingly high one. We have to guard against this.

I think we have again to start talking of the matter of a code: I will admit that it might be better if we were able to continue to do without this. In the old days the head of the firm set the standards. Mostly these were high, sometimes they were neutral—Laodicæan—occasionally they were low. Those working under them saw the standard and, following the good, struggled against, or surrendered to, the bad. Today a committee must search itself just as an individual does, and arrive at certain principles on which to build the code to which the herd that it represents should aspire.

I would suggest that each committee decides that, in the hospital it represents or in those it governs, nothing should ever be done that savours of teaching by terror, of appointment by fear; and that expediency should never be allowed to introduce any such thing.

T. B. LAYTON.

TUBERCULOUS ABSCESS AT THE SITE OF INJECTIONS

SIR,—In your issue of April 30 Dr. Forbes and Dr. St. Clair Strange reject the theory of Dr. Elek (April 9) that penicillin powder as manufactured may contain living (human) tubercle bacilli; and they comment on the fact that the nine published cases of this complication had no demonstrable focus of tuberculosis anywhere else.

It seems to me that this last point is significant; I can understand one or two cases with no other demonstrable focus, but not nine. It must be remembered that the published cases are only a fraction of those that actually occur. I have recently seen another of these cases and would like to put forward again the opinion, previously expressed,[1] that infected dust from the ward is drawn with air into the syringe or infusion bottle at the time of the injection. I know this opinion is very unpopular, but so—very often—is the truth.

St. Margaret's Hospital, Epping, Essex. FRANK MARSH.

"COLIFORM"

SIR,—The term "coliform" has for some time had an obscure meaning and it has become increasingly clear that a definition is desirable. Those interested in medical and veterinary bacteriology have used it to embrace only the morphological characters of many species, not of *Bacterium coli* alone but of the dysentery bacteria, the salmonellæ, and other gram-negative rods similar to *Bact. coli*. On the other hand the term "coliform" is restricted by many water and dairy bacteriologists to those organisms which are not only morphologically similar to *Bact. coli* but which resemble it in its cultural and biochemical characteristics; some have even regarded it as being synonymous with *Bact. coli* of fæcal origin.

Because of this confusion and also because there is now a closer liaison between all those who study bacteria from whatever aspect, a committee of nine representing this variety of interests was appointed by the Society for General Microbiology and by the Society for Applied Bacteriology. This committee met on several occasions and discussed the matter from wide angles, and the relevant portion of their report is appended. It is hoped that bacteriologists in general will understand and agree upon the meaning of the term "coliform."

1. The term "coliform" means "like *Bacterium coli*," or "coli-like."

2. "Coliform" is an adjective and as such has no generic or ecological significance.

3. It is proposed that the term "coliform" should refer to gram-negative rods resembling *Bacterium coli* in morphology and staining-reactions but not necessarily in cultural and biochemical characteristics.

4. The widest publicity should be given to this definition to prevent the term being employed to define different specific types by different workers or to restrict the term to particular branches of bacteriology.

The committee are convinced that the proposed definition is the only one satisfactory to all interests in bacteriology, and are opposed to any definition based on ecology or biochemical reactions. Existing systems allow for classification of organisms grouped under the wide term now proposed.

Royal Veterinary College, London, N.W.1. REGINALD LOVELL (Society for General Microbiology).

Butterwick Research Laboratories, Welwyn, Herts. C. B. TAYLOR (Society for Applied Bacteriology).

1. Marsh, F. *Lancet*, 1946, ii, 508.

FEMALE CIRCUMCISION IN THE SUDAN

SIR,—It was most interesting to read Dr. Leach's letter in your issue of April 30, for she is an expert on the subject. It is not quite clear, however, from her letter whether the remaining 1514 children had escaped circumcision altogether, or had it yet to come? A vital point! It would also be of interest to know, if possible, how many of the children Sunna-circumcised were the offspring of two Sudanese parents, of mixed marriages, or of non-Sudanese parents. The Sunna to which Dr. Leach refers is not the "Government" Sunna legalised by the Sudan government in 1946 but the "Egyptian" Sunna made illegal, together with Pharaonic circumcision, in 1946. Done without controlling supervision the Egyptian variety can, in its worst form, be almost as bad as the Pharaonic.

London, S.W.1. CONSTANCE E. HUDDLESTON.

HOSPITAL APPOINTMENTS

SIR,—I read last week's letter under this heading with sympathy and sardonic amusement. Until quite recently I believed that if an aspirant for a hospital appointment was unable to find or obtain one, he would be able, with some regrets no doubt, to enter the ranks of the general practitioners, where we are assured almost daily there is a grave shortage of doctors. It is in fact almost impossible to get into general practice except as a trainee assistant or assistant without view.

I imagine that a man who has done many years of hard work and obtained a higher qualification will not relish the thought of becoming a trainee assistant, especially as such a post offers absolutely no security at all. There was a time when the possession of a medical qualification enabled a man to make a living with a reasonable degree of security. This is not so today, and unless something is done very soon to alter this state of affairs, the medical schools instead of being full to capacity will be half empty, and the whole structure of British medicine will be in serious danger.

ANOTHER REGISTRAR.

GLASSES OFF THE PEG

SIR,—Your annotation last week could cause harm if taken literally. There are certain occasions when a pair of spectacles, bought from Woolworth's or borrowed from a friend, may help a person to read fairly well and to perform a particular task without undue discomfort. There are good reasons, however, why it is most unwise for anyone to obtain spectacles in this way and to use them instead of properly prescribed glasses.

Most eyestrain is caused by the inability of the eyes to work together in harmony for long periods, because of muscular imbalance or a difference of clarity between the two eyes. Few people have eyes of the same refractive error, and some 60% of the population have astigmatism in one or both eyes. Some individuals are insensitive to small errors of refraction, but others appreciate the smallest difference of prescription. In the latter cases, particularly, it is necessary to investigate the functioning of the binocular apparatus carefully if a satisfactory prescription is to be given. In many cases lenses do have

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a curative effect, and contrariwise the wrong lenses can establish bad habits of seeing which may be difficult to cure later on.

For a person whose eyes are the same, who has no astigmatism in either eye and no muscular imbalance, and who is capable of judging the strength of lens required merely by reading through it, glasses from Woolworth's are quite safe, but for the great majority of the population an examination by an ophthalmologist or ophthalmic optician is the only wise plan.

S. BLACK
Director, Association of Optical Practitioners.

65, Brook Street, London, W.1.

INFLUENCE OF RESTRAINT ON AUTOMATIC MOVEMENTS

SIR,—In their article on this subject, Professor Vujic and Dr. Kurtes [1] said: "In unilateral cerebellar lesions Wartenberg (1930), Marburg (1936), and Holmes (1946) find that arm-swinging disappears." This would seem to mean that it was Wartenberg who first described the disappearance of arm-swinging in unilateral cerebellar lesions. Such is not the case. In two articles on a cerebellar sign [2] I only stressed the clinical importance of this phenomenon. In both articles I quoted several authors who, long before me, described the influence of a cerebellar lesion on arm-swinging. I particularly quoted Gordon Holmes, who in 1917 first described this phenomenon.[3] In his book,[4] quoted by Vujic and Kurtes, Holmes simply repeated what he had said long before (1917, 1922, 1930, 1939).

San Francisco. ROBERT WARTENBERG.

FATAL AIR EMBOLISM DURING BLOOD-TRANSFUSION

SIR,—I recently investigated a fatal case of air embolism which occurred during blood-transfusion at one of the hospitals served by this laboratory. The details of the case are remarkably similar to those described last week by Dr. Doyle and Dr. Frodsham, and the apparatus used was similar except that the filter was made of metal gauze instead of stockinette.

After the operation the patient returned to the ward in good condition, and with a blood-transfusion running satisfactorily. When later the drip stopped, a Higginson's syringe was used to raise the air-pressure in the bottle and so restart the flow. The patient collapsed almost at once and died shortly afterwards. Although the bottle contained blood, its delivery tube was seen to be empty, and at post-mortem examination air was demonstrated on opening the heart under water.

I examined the transfusion apparatus and found the level of the blood in the bottle to be about 1 ml. below the top of the gauze, so that it was well above the top of the outlet tube; yet when I blew air into the top of the inverted bottle with the Higginson's syringe it delivered air, not blood. The apparatus was tested for leaks and found to be satisfactory, but on emptying out the blood the gauze filter was found to be covered by "slime." As a further test, normal saline was poured into the bottle and allowed to run from the reassembled transfusion apparatus with the air-pressure above it increased with a Higginson's syringe. Saline flowed out at first, but when the top of the gauze had only just appeared above the surface of the fluid, air began to escape from the needle. It seems clear that the gauze was completely blocked except at the apex, so that it behaved as if it were a solid delivery tube.

This case again shows the risk involved in the use of a Higginson's syringe; its extreme danger when the blood-level reaches the top of the filter does not appear to be as well known as it should be, for one can never know whether the filter has become partially blocked in this way or not.

GREGOR GRANT.

Donaldson-Hudson Pathological Laboratories, Royal Salop Infirmary, Shrewsbury.

1. *Lancet*, 1948, ii, 527.
2. *Dtsch. Z. Nervenheilk.* 1930, **116**, 145; *J. Amer. med. Ass.* 1939, **112**, 1454.
3. *Brain*, 1917, **40**, 461.
4. Introduction to Clinical Neurology, Edinburgh. 1946.

Parliament

A Hospital for Tropical Diseases in London

IN the House of Commons on April 27 Mr. IVOR THOMAS asked what provision was to be made in this country for the treatment and teaching of tropical diseases. He recalled that when the London School of Tropical Medicine was founded in 1898 it was located at the Albert Dock Hospital, where clinical material was to be found. It was the essence of Manson's idea that teaching, treatment, and research should be carried on by one organisation in one group of buildings. At the outbreak of the first world war the school was closed. When the war ended the Hospital for Tropical Diseases was established in Gordon Street, Bloomsbury, and the school, which had been closed during the war, was opened there in 1920. In 1924 the original school was merged in the new London School of Hygiene and Tropical Medicine. This meant a separation of teaching from the treatment of disease which Mr. Ivor Thomas thought was unfortunate. At the outbreak of the second world war, the building in Gordon Street had to be closed because it was unsuitable for use as a hospital under threat of air attack, and later it was made untenable by a land mine which fell behind it. When the war ended a temporary hospital for tropical diseases was reopened in Devonshire Street. Good work had been done there in spite of limited accommodation, but no-one would claim that it was an adequate centre for the treatment of tropical diseases.

Mr. Ivor Thomas's own view was that a comprehensive hospital should be set up which should have a legal entity as a postgraduate teaching hospital, with its own board of governors. It should be erected within the curtilage of the University of London in order to be near the London School of Hygiene and Tropical Medicine. The scheme would probably cost £1 million, but nothing less would be worthy of our imperial responsibilities and the gravity of the problems to be treated.

Under the National Health Service Act the responsibility for these matters passed from the Colonial Office to the Ministry of Health, and Mr. Ivor Thomas felt some anxiety, for on the surface it would not be expected that the Minister of Health would pay so much attention to the problems of, say, Kenya as he would to those of, say, Ebbw Vale. He felt his disquiet was justified when in answer to a parliamentary question last February Mr. Bevan had said it was proposed to develop a tropical-diseases centre as a unit of the University College Hospital group. This, Mr. Ivor Thomas held, was not a forthcoming reply. He thought a worthy tropical-diseases hospital should comprise inpatient accommodation of 150 beds; an adequate outpatient department both for the diagnosis of disease and for the determination of the fitness of persons seeking to work in the tropics; laboratories for routine parasitological, bacteriological, serological, hæmatological, and pathological work; research laboratories for the professor of tropical medicine, the Colonial Medical Research Service, and the staff of the Colonial Office engaged on research into nutrition; a radiological department; full facilities for the instruction of postgraduate students; hostels for nurses and for medical and administrative students from overseas; and an inoculation department.

Dr. HADEN GUEST thought Mr. Ivor Thomas was out of touch with present difficulties of staffing. The Hospital for Tropical Diseases was efficient, but anything like the scheme suggested was out of the question. Nor was it necessary to provide anything like 150 beds. Dr. STEPHEN TAYLOR, a governor of University College Hospital, said that one practical difficulty was the collection of tropical cases. Until recently the places in the existing temporary hospital were nothing like filled, partly because many medical officers and specialists in London, having had experience of the treatment of tropical diseases in the Forces, were anxious to use that experience in their own wards in London. He could assure Mr. Ivor Thomas that the governors wished to see a really worthy tropical-diseases hospital and unit developed as part of University College Hospital.

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Dr. Taylor felt that the study of tropical diseases would benefit greatly from the intimate association of the general medical school. On the other hand, he was not sure that it would be a good idea to segregate medical postgraduate students from other postgraduate students. A better plan might be to mix them. In what was hoped would be its new location, the old St. Pancras Hospital, the tropical-diseases unit would not be much farther away from the University of London than it was in the old building, and the premises would be more suitable than those in which it was accommodated in the inter-war years.

Mr. ARTHUR BLENKINSOP, parliamentary secretary to the Ministry of Health, said that it had been decided that it would be more in keeping with the National Health Service to develop not a completely isolated and separate tropical-diseases hospital, but a separate unit which would be in the closest association with one of the large teaching hospitals. The Devonshire Street Hospital had therefore been associated with the University College Hospital group and had become a unit within the teaching group of that hospital. But that was not a satisfactory permanent arrangement. It was now proposed to improve the facilities by adding a more adequate inoculation centre. A proposal was being considered by the University College Hospital group which would provide a considerable unit distinct from, but at the same time associated with, St. Pancras. The suggestion was that they might utilise there a modern block which was not distinct from the rest of the buildings, but which would have the great advantage of having the facilities of a great hospital by its side. It was hoped that a decision would be reached before long.

QUESTION TIME

Hospital Administration

Mr. ANTHONY MARLOWE asked the Minister of Health why he was unable to ascertain how many persons were now in receipt of payment for jobs in hospitals which were done voluntarily prior to July 5, 1948.—Mr. ANEURIN BEVAN replied: I could no doubt ascertain the numbers, but I do not consider it of sufficient importance to justify asking for a special return from 2835 hospitals when they are so fully occupied otherwise. Mr. MARLOWE: Does the Minister realise that this is a question about which he could ascertain the information without interfering with the medical service of the hospitals? Is it not right that Parliament which votes this money should ensure that there is no unnecessary extravagance?—Mr. BEVAN: The administration of the hospital is responsible for providing the medical services of the hospital. If the administration have additional work to do they cannot do their medical administration as they should. (Cries of "Nonsense.") We are continually being reproached by the Opposition that there are too many forms to fill up and too much paper work. It would be necessary to investigate how every voluntary hospital in Great Britain did its work before the Act came into operation, and compare that with how it is doing its work now, in order to get this information.

Mr. GODFREY NICHOLSON: Would it not be in the public interest if sample inquiries were made, not necessarily covering all the hospitals, to find out the dimensions of this problem? Surely the Minister realises that his scheme stands or falls by the economical and efficient way in which the nation's money is spent?—Mr. BEVAN: It is a very remarkable thing that the whole of the National Health scheme is now administered by 10,000 to 11,000 voluntary persons who are not paid anything. We cannot call to account officials employed in an official capacity unless they are paid a salary. Mr. MARLOWE: Does the Minister realise that without information of this kind his denials of extravagance in the administration of this service are worthless?—Mr. BEVAN: And without information of this kind accusations of extravagance are nonsense.

Closed Beds

In answer to a question Mr. BEVAN stated that the number of beds closed for want of staff in hospitals in Great Britain on Dec. 31, 1948, was 59,903, made up as follows:

Tuberculosis sanatoria	5,669
Fever hospitals	15,915
General hospitals	21,642
Other specialised institutions.. ..	16,677
	59,903

M.R.C. Employee's Death

Mr. S. T. SWINGLER asked the Minister if he would consider the payment of compensation to the parents of Edward Gill, of Stone Road, Stafford, who died from typhoid as a result of his work in a bacteriological laboratory in Stafford at the time of the typhoid outbreak in Shropshire.—Mr. BEVAN replied: While I deeply sympathise with the parents I am advised that I am not liable for such a payment. But a grant has been made ex gratia to Mr. Gill's father which he has accepted in full and final settlement.

Mr. SWINGLER: Is the Minister aware that the national insurance officer has given a decision that the tragic death of Edward Gill resulted from his employment, and does he not think that the Medical Research Council, as the employers of Edward Gill, should have accepted some responsibility? Is he further aware that their more generous offer has only been made since this question was raised?—Mr. BEVAN: The last part of the hon. Member's supplementary question reveals the value of the House of Commons itself. In reply to the first part, I think it is quite clear that it is admitted that the boy contracted typhoid in the service of the Medical Research Council. That is the reason why, in consultation with the Treasury solicitors, an ex-gratia grant of £132 was made to the father.

Prescriptions by School Medical Officers

Mr. D. L. LIPSON asked the Minister if he was aware that, when children were given prescriptions by a doctor at a school clinic, their parents had to pay the chemist for the medicines supplied; and, as this was contrary to the principle of the health service, if he would take steps to amend the regulations so as to provide that no charge should be made.—Mr. BEVAN replied: Any medicines supplied at these clinics are provided free, but if a school medical officer thinks a pupil requires a prescription he would no doubt refer him to his National Health Service doctor, who could prescribe for free supply under the service. Mr. LIPSON: Is it not a rather cumbersome proceeding for one doctor to have to send a child to another already overworked doctor?—Mr. BEVAN: No. The school medical service is grant-aided and it would be extremely difficult to operate the National Health Service in respect of this matter through the grant-aided service of the schools. It is also exceedingly undesirable for two doctors to have charge of one patient. Mr. LIPSON: Is the Minister aware that these children are sent to the school clinics by the authority, and surely the doctors there are fully qualified? Is it not advisable that they should be given the same right as any other doctor to give a prescription?—Mr. BEVAN: The whole difficulty is to operate the National Health Service through the grant-aided medical service. Very little difficulty need be experienced by a person going to his own family doctor. It is the intention eventually to assimilate the therapeutical side of the school medical service into the National Health Service because of these difficulties.

Domiciliary Service for Old People

Mrs. BARBARA CASTLE asked the Minister how far, in view of the number of old people living alone in unsatisfactory circumstances, his regulations, made under the National Assistance Act, 1948, enabled local authorities to provide a welfare service for them in their own homes.—Mr. BEVAN replied: Health visiting, home nursing, and domestic help services of local authorities under the National Health Service Act are available to old people living in their own homes, and the National Assistance Act empowers local authorities to contribute to voluntary organisations which provide recreation or meals for old people. A local authority who are a civic restaurants authority can include a mobile meal service in their civic restaurants service which is, of course, of particular help to old people.

Mrs. CASTLE: Is the Minister aware that surveys made in certain industrial areas have shown that there are hundreds of old people living alone who require visiting, and who require someone to keep in touch with them, and perhaps do their shopping, and so on? It would appear that this power is not in the hands of local authorities under the National Assistance Act, and they would welcome being able to do that. Would he have any objection to their undertaking this service as a welfare authority under the National Assistance Act?—Mr. BEVAN: That is another matter, and I will certainly look into it. I fully appreciate the fact that there are very large numbers of old people who are now living in their own homes, which fortunately they are now able to do in much larger numbers. I will certainly look into the possibility of extending the service.

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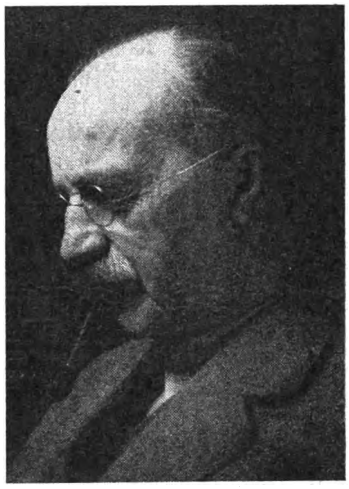
Obituary

ALFRED ERNEST BARCLAY

O.B.E., M.D. CAMB., D.M., D.SC. OXFD, F.R.C.P., F.F.R.

Dr. A. E. Barclay died at his home at Oxford on April 27 at the age of 72. Formerly lecturer in radiology at Manchester and at Cambridge, he developed the use of X rays, and particularly cineradiography, for the study of alimentary and other functions in health and disease. During the last thirteen years of his life he was honorary radiologist to the Nuffield Institute for Medical Research at Oxford, and for a short period its acting director. There, by his technique of microradiography, and his inspiring curiosity, he played a large part in several major investigations—notably the study of the fœtal circulation and the discovery of vascular shunts in the kidney and stomach.

He was born in Manchester, the son of Robert Barclay, and educated at the Leys School and Christ's College, Cambridge. For his clinical studies he came to the London Hospital, where after qualifying in 1904 he held various house-appointments. Even in his student days he was interested in radiology, and in 1906 he returned to Manchester to become honorary radiologist to Ancoats Hospital and two years later to the Manchester Royal Infirmary.



The value of his radiological opinion was soon recognised by his colleagues, and within a short time he had built up an extensive private practice in association with Woodburn Morison. Later they were joined by Ronald Paterson and E. W. Twining. Even before qualification Barclay had seen that medical radiology had immense scope, and his inquiring mind was constantly seeking methods of investigating the hidden mysteries of the abdomen, the heart, and the brain. Although Haudek was the first to describe, in 1910, the X-ray appearances of the gastric ulcer, Barclay had probably observed them about the same time. He published a short paper on gastric radioscopy in the *Archives of the Roentgen Ray* in 1910, and later in the same year, in the *British Medical Journal*, an article on the normal and pathological stomach as seen by X rays. He was certainly the first to describe the deformity of duodenal ulcer, and in 1912 he published a short textbook on *X-Ray Diagnosis and Treatment*.

During the 1914–18 war, while serving with the R.A.M.C., Barclay played a considerable part in the training of radiologists for war service and in the development of suitable equipment, and in 1918 he was appointed O.B.E. It was this work that led him to realise the necessity for systematic training in radiology, and with Stanley Melville and Robert Knox he succeeded in persuading Cambridge University to set up a diploma in radiology. At the same time this long-sighted triumvirate established the British Institute of Radiology on a firm footing by amalgamating it with the Röntgen Society, and they also took a big part in the creation of the X-Ray and Radium Protection Committee.

On the death of Shillington Scales in 1927, Cambridge was left without a lecturer in radiology, and the university was reluctant to break with tradition and maintain a postgraduate course of study indefinitely. The dangers of a long hiatus in training were obvious; the Cambridge diploma would die abruptly unless some outstanding person applied for the lectureship; and although Barclay knew that such a position would give less scope to his talents and energy he at once sacrificed his beloved Manchester and clinical work to preserve the continuity of radiological teaching. Under his wise guidance the diploma flourished, and during his first few years at Cambridge he also wrote his comprehensive book on the *Digestive Tract* which appeared in 1933. Here, too, he began the work on direct cineradiography which finally led to the brilliant researches in Oxford. He was amazingly good with his hands, and in his own workshop he constructed the first primitive apparatus with which he made many interesting observations on the movements of the large intestine. This work absorbed him, and when in 1937 other universities and colleges undertook to carry on radiological teaching he felt free to accept Dr. K. J. Franklin's invitation to join him at the Nuffield Institute for Medical Research at Oxford in applying radiological techniques to the problems of physiology.

The research partnership so begun lasted eleven years, and those who coöperated included R. G. Macbeth, Sir Joseph Barcroft and D. H. Barron, E. C. Amoroso, Miss M. M. L. Prichard (who became a permanent member of the institute staff), J. Trueta and J. M. Barnes, the Army Malaria Research Unit (under B. G. Maegraith), and P. M. Daniel. Among the findings were new facts about the excretion of dusts from the lungs, the fœtal circulation and cardiovascular system and their changes at birth, and the mode of action of mepacrine. Finally came the important studies of renal circulation instigated by Trueta which were reported in this journal in 1946 and fully published in 1947.

The outbreak of the war in 1939 temporarily interrupted Barclay's research, for he was at once appointed consulting radiologist to the Ministry of Health and became responsible for the organisation of the civilian radiological services in the regions. He delegated little of this work, and he travelled the length and breadth of the country, visiting every radiologist and hospital and getting first-hand knowledge of local problems. For the first twelve months of the war he never spared himself, and the information he acquired not only about radiology but about the medical services generally were invaluable to the Ministry.

Two years ago he underwent a major operation. He made a quick recovery, and, though well aware of the possible recurrence of his trouble, returned at once to his research work. In his last year he produced with F. H. Bentley their brilliant and exciting paper on circulatory shunts in the stomach. His health was obviously failing and he had some unpleasant pulmonary attacks; but when he went to a Torquay hotel for the winter he took his micro-arteriography apparatus with him, and, despite increasing weakness, managed to make an interesting series of observations on intracellular deposits of hæmatite in iron-workers' lungs. Being unable to obtain a suitable beryllium window X-ray tube for this work, he quickly devised an ingenious vacuum cassette which by reducing air-filtration enabled him to obtain the essential pictures.

Barclay loved people, and wherever he went he made friends. He had travelled widely in America and the Commonwealth and almost to the day of his death kept up a lively correspondence with colleagues abroad. During his Manchester days he was a keen supporter of the Hallé orchestra, an interest which he maintained after he had come South. His workshop, an engineer's delight, was his main hobby, but he was an excellent gardener and a keen fisherman. His energy was amazing, and even on holidays he would sit down at the end of a day's fishing and write letters of advice to juniors, letters to friends abroad asking for information on new methods, and letters to friends at home on an astonishing range of subjects.

"Despite steadily failing health," writes J. T., "Dr. Barclay never lost his optimism, perhaps the most enchanting of his characteristics, nor his kindly interest, both due to his eternally youthful spirit. To those who only knew him through his written works the news of his death will bring a sense of loss. But to those who, like myself, had the privilege of being among his intimate friends—a legion on both sides of the Atlantic—his death will leave a permanent emptiness. To us he was

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not just a great investigator and radiologist; he was also 'Uncle B.,' a man of great heart and unbounded capacity for love."

During his last months he was busy writing a book on radiological methods as applied to research. He was able to finish the manuscript, and this posthumous book will remain as his last contribution to the progress of medicine to which he dedicated his life. J. G., his publisher, as one who was privileged to see something of him from a rather different angle, describes how "once or twice a week for the last three years, there has been a gentle knock on the office door and Uncle B. has entered, diffident, kindly, helpful, anxious to know the progress of publication of work upon which his heart was set. It is difficult to comprehend that we shall see him no more; to realise that the great spirit of the man is no longer with us. In these last twelve months he knew that time was short for him; he referred to it cheerfully, with regret, but without trace of ingratitude. And he kept steadily working when lesser men would have abandoned their last, long since. He had lived well and saw his work within sight of completion. He faced death, as he had faced disappointments earlier in his career, with fortitude and with understanding." In a letter to a colleague about two months ago he spoke of the happiness which he had derived from continuing his scientific activity instead of retiring. "Those near to him," writes K. J. F., "know of the assiduity and fine courage with which he endeavoured, right up to the end, to establish even more firmly his final contribution to the technique and art of radiology. Those who never knew him will find revealed in his forthcoming book many of the qualities which were so characteristic of him as a scientist—a devotion to radiology, a lively imagination, a high technical skill, a considerably mechanical flair, a delight in the functioning of the body's structure, and a lack of acceptance of any artificial division of original medical investigation into preclinical and clinical moieties. If British and world radiology are infinitely the poorer for his going, so also is medical science as a whole, for research radiologists of his calibre and outlook are few and far between."

The esteem in which he was held among his colleagues wherever he worked is shown by the formal honours he received. He had served as president of the Röntgen Society, of the British Institute of Radiology, and of the electrotherapeutics section of the Royal Society of Medicine. In 1931 he was appointed Silvanus Thompson lecturer. He was elected F.R.C.P. in 1941 and F.F.R. in 1948. Oxford conferred the D.M. on him in 1936 and the honorary degree of D.SC. in 1947. He was to have received an honorary degree from Manchester this month. He was an honorary fellow of the American College of Radiology and an honorary member of the Radiology Society of North America and of the Australian and New Zealand Association of Radiology.

Dr. Barclay married in 1906 Miss Mary McFarlane, who survives him.

The photograph is by Mr. S. Shah Khan, M.A.

Appointments

*PARKER, W. S., M.B. Manc., D.P.H., D.I.H.: deputy M.O.H., Brighton.
VAN LANGENBERG, E. R., M.R.C.P.: senior M.O., head and spinal injuries centre, Stoke Mandeville Hospital, Aylesbury, Bucks.

Selly Oak Hospital, Birmingham:
CRUICKSHANK, C. D., M.R.C.S.: asst. pathologist.
MANDELTORTE, J. J., M.D. Warsaw: asst. radiologist.

Colonial Service:
ADAMSON, P. B., M.B. Lond.: pathologist, Nigeria.
ANDERSON, T. F., O.B.E., M.A., M.D. Camb., D.T.M. & H.: deputy director of medical services, Kenya.
BAIRD, D. A., M.B., B.SC. Edin.: senior M.O., British Somaliland.
BOARD, A. J., M.B. Brist., D.T.M.: senior M.O., Northern Rhodesia.
EDMUNDSON, KENNETH, M.B. Lpool: asst. director of medical services, Tanganyika.
EVANS, THOMAS, M.R.C.S., D.P.H., D.T.M. & H.: senior M.O., Northern Rhodesia.
FOK, P. H. T., L.R.C.S.E.: asst. M.O., Hong-Kong.
KERR, A. C. DE C., B.A. Camb., M.R.C.S.: M.O., Federation of Malaya.
RASSIM, H. S., M.R.C.S., D.M.R.E.: radiologist, Hong-Kong.
RERRIE, J. I., M.R.C.S., D.P.H.: tuberculosis officer, Jamaica.
ROBERTSON, E. L. S., M.B. Aberd., F.R.C.S.: M.O., grade B, Trinidad.
SYCHTA, STANISLAW, M.B. Polish School of Medicine: M.O., North Borneo.
WATSON, H. P., M.B., B.SC. St. And., F.R.C.S.E.: M.O., grade A surgeon, Trinidad.

* Amended notice.

Diary of the Week

MAY 8 TO 14

Monday, 9th

MEDICAL SOCIETY OF LONDON, 11, Chandos Street, W.1
8 P.M. Annual general meeting.
8.30 P.M. Mr. A. C. Palmer: Temperament. (Annual oration.)
WEST LONDON MEDICO-CHIRURGICAL SOCIETY
8.30 P.M. (1, Wimpole Street, W.1.) Mr. Justice Birkett: Contribution of Law to Literature. (Cavendish lecture.)

Tuesday, 10th

INSTITUTE OF DERMATOLOGY, 5, Lisle Street, W.C.2
5 P.M. Dr. G. B. Dowling: The Sclerodermas.
INSTITUTE OF LARYNGOLOGY AND OTOLOGY, 330, Gray's Inn Road, W.C.1
2.15 P.M. Dr. E. H. R. Harries: Respiratory Tract in Infectious Disease.
ST. MARY'S HOSPITAL MEDICAL SCHOOL, W.2
5 P.M. (Wright-Fleming Institute.) Mr. E. F. Gale, PH.D.: Biochemical Properties of the Bacterial Cell Wall. (Second of six Almroth Wright lectures.)
UNIVERSITY OF LONDON
5.30 P.M. (London School of Hygiene, Keppel Street, W.C.1.) Prof. J. Tréfouël (Paris): Advances in Chemotherapeutic Research at the Pasteur Institute.

Wednesday, 11th

UNIVERSITY OF GLASGOW
8 P.M. (Department of ophthalmology.) Dr. Fergus Campbell: Pupillary Movements.

Thursday, 12th

INSTITUTE OF DERMATOLOGY
5 P.M. Dr. B. Russell: Anogenital Pruritus.
ST. GEORGE'S HOSPITAL MEDICAL SCHOOL, S.W.1
4.30 P.M. Dr. Desmond Curran: Psychiatry lecture-demonstration.
UNIVERSITY OF BIRMINGHAM
4 P.M. (Anatomy theatre.) Prof. E. B. Verney, F.R.S.: Excretion of Water by the Kidney with special reference to its Neurohypophysial Control. (First William Withering lecture.)
UNIVERSITY OF DURHAM
5.15 P.M. (Royal Victoria Infirmary, Newcastle-on-Tyne.) Prof. C. F. M. Saint: Morison Approach to Hydatid Disease. (Rutherford Morison lecture.)
HONYMAN GILLESPIE LECTURE
5 P.M. (Anatomy theatre, University New Buildings, Teviot Place, Edinburgh.) Dr. H. N. Robson: Medical Aspects of Splenectomy.

Friday, 13th

UNIVERSITY OF LONDON
5.30 P.M. (King's College, Strand, W.C.2.) Prof. K. Gollwitzer-Meier (Hamburg): Heart Metabolism and Coronary Disease.
UNIVERSITY OF BIRMINGHAM
4 P.M. Professor Verney: Excretion of Water by the Kidney. (Second William Withering lecture.)

Births, Marriages, and Deaths

BIRTHS

BELCHER.—On April 28, in London, the wife of Mr. J. R. Belcher, F.R.C.S.—a son.
BLACKNEY.—On April 7, the wife of Dr. Roger Blackney—a daughter.
MILLS.—On April 23, at Bournemouth, the wife of Mr. W. G. Q. Mills, F.R.C.S.—a daughter.
MINTO.—On April 23, the wife of Dr. W. H. P. Minto—a son.
RIGBY.—On April 19, in London, the wife of Dr. J. P. V. Rigby—a daughter.
TAYLOR.—On April 22, the wife of Dr. J. W. Taylor—a daughter.
THOMPSON.—On April 23, the wife of Dr. H. H. Thompson—a son.

MARRIAGES

CAMPBELL—FITZPATRICK.—On April 28, at East Grinstead, William Campbell, M.B., to Eithne Mary FitzPatrick.
CHESSER—HESKETH.—On April 27, at Tunbridge Wells, Samuel John Chesser, M.B.E., M.R.C.S., to Mrs. Jean Mary Hesketh.
DOLTON—D'ABREU.—On April 23, in London, Eric Granville Dolton, F.R.C.S., to Lorna Ruth Julie d'Abreu, M.B.
FOSKETT—LIGHTBURN.—On April 23, at Ingatestone, Essex, Derrick Foskett, M.R.C.P., to Joan Lightburn.
KINNEAR—AUSTIN-SPARKS.—On April 30, in London, Angus Ian Kinnear, M.R.C.S., to Jean Alison Austin-Sparks.
MACLEAN—LANCASTER.—On April 23, at Woldingham, Andrew Bruce MacLean, F.R.C.S., to Morwenna Grace Lancaster.

DEATHS

BARCLAY.—On April 26, at Oxford, Alfred Ernest Barclay, O.B.E., M.A., M.D. Camb., F.R.C.P., F.F.R., D.M.R.E.
DEVAS.—On April 23, Horace Charlton Devas, M.R.C.S., surgeon captain, R.N. retd.
FORREST.—On April 30, James Forrest, M.B. Edin., aged 72.
GEMMELL.—On April 20, Leonard Woodburn Gemmell, M.B. Glasg., surgeon commander, R.N. retd.
KAY.—On April 24, at Leamington Spa, Winifred Julia Kay, M.B. Lond.
MORSE.—On April 21, at Boscombe, Hants, Charles George Hugh Morse, M.A., M.B. Camb., aged 65.
MCENTIRE.—On April 25, in London, Samuel Drummond Greer McEntire, L.R.C.P.I., D.P.H.
MCGREGOR.—On April 23, in Glasgow, George Charles McGregor, M.B. Aberd.
O'DOWD.—On April 27, in Jersey, Francis John O'Dowd, M.R.C.S.

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Notes and News

THE NAPKINLESS AGE

LIVING as we do in the gadget period, it is remarkable that we allow anything so primitive as the baby's napkin to survive, let alone provoke debate among the learned.[1] Destructible sanitary towels have long replaced the washable kind in civilised communities, and washable napkins could surely be superseded in the same way. Many mothers already reduce heavy napkin-washing by covering the child's buttocks with a large piece of cotton-wool or cellulose (which can be thrown away when soiled) before they apply the napkin; but this is an expensive practice, and does nothing to prevent napkin wetting.

Two men in Ohio [2] think they have found the right solution. Dr. C. F. McKhann and Mr. George Bricmont observe that the normal infant voids a great deal of urine and has one, two, or three, or more stools daily. In a state of nature these excrements would fall to the ground, doing his tender skin no harm, whatever public-health problems the practice might raise. As it is, wet irritating material remains clapped to his loins for periods varying with the efficiency, sense, or opportunities of his mother. Intertrigo, sore buttocks, eczema, ulceration, cystitis, and pyelitis, and the spread of gastro-enteritis in children's wards may all be traced to the use of napkins, or the transmission of infection by those who have to change them.

To fulfil hygienic and sanitary demands, McKhann and Bricmont thought, the napkin should collect urine and faeces in such a way that the child's comfort and health are not imperilled; it should limit their spread and reduce contamination of the surroundings; it should be capable of disposal without gross handling by the attendant; and it should be convenient. They therefore designed a boat-shaped container of waterproof material into which fits a pad of absorbent material lightly impregnated with antiseptic. The container fits snugly between the baby's legs, and the pad, which is not in contact with his skin, collects the excreta. The antiseptic prevents ammonia formation, and the mother can get rid of the pad by grasping the two ends of the container and pressing on the middle of the outer surface with her thumbs, when the pad drops out without touching her fingers. The principle is that of a sanitary towel held well away from the skin. Babies are said to sleep longer and more soundly when wearing this device than they do in ordinary napkins. The garment looks pleasant, and emits no napkin smell; babies wearing it are convenient to handle, and their psyches doubtless profit by such an impersonal method of protection. Perhaps this solves the problem of toilet training in the first year—if it can be made cheap enough for the woman who does her own washing.

REUNION

THE recent war interrupted the annual meetings of the British Medical Association for nine years—from July, 1939, to July, 1948. In the same way the 1914–18 war broke the series between July, 1914, and July, 1920. In a memorable address given at the 1920 meeting, Sir Clifford Allbutt discussed the transition of medicine from an art of observation and empiricism to an applied science founded on research—"from a set of rules and axioms of quality to measurements of quantity." Sir Lionel Whitby, addressing the association in 1948, surveyed the long swift journey medicine has made along that road since his predecessor spoke. The papers given last year at the scientific sections illustrated his theme. They now appear in a serviceable volume,[3] as a record of a happy and constructive reunion.

SOCIAL ASPECTS OF RHEUMATISM

THE Heberden Society met on April 8 to discuss rheumatic disease from the clinicosocial standpoint. The chair was taken by Dr. Alice Stewart, assistant director of the School of Social Medicine at Oxford. She called for a statistical approach, and suggested that in each case information was required under six headings: (1) family constitution; (2) major financial stresses; (3) housing arrangements; (4) public services available; (5) follow-up arrangements; and (6) results achieved. Dr. C. B. Heald suggested that numerical values should be given empirically to these various factors so that the physician in charge of a case could readily gauge the significance of each; moreover, such figures might be of statistical value. Mr. W. D. Coltart objected that he was interested only in the practical effects of the various social factors on the disability of the individual patient; in dealing with a patient variations in empirical numbers were of no significance to him. Dr. Stewart proposed that a committee of doctors and almoners should work out the main headings for a social case-report; this would enable definite information to be obtained in due course.

1. *Lancet*, April 30, 742.
2. *J. Pediat.* 1949, **34**, 131.
3. Proceedings of the Annual Meeting of the British Medical Association, 1948. London: Butterworth. 1949. Pp. 415. 35*s*.

PROVIDENT SCHEME

THE British United Provident Association Ltd., a non-profit-making, mutual-aid organisation, has lately provided a special range of scales to insure doctors and their families against maintenance charges during illness. The association's offices are at 61, Bartholomew Close, London, E.C.1.

THE MEDICAL DIRECTORY

THE 1949 issue [1] contains 74,523 names of medical practitioners as against 73,179 last year; and last year's list of 4341 temporarily registered foreign practitioners is superseded by a "foreign list" of 864 names. (This will, we understand, be discontinued in the next issue.) The National Health Insurance local medical and panel committees and the London County Council's hospitals and mental-health services have disappeared. Newcomers are the Ministry of National Insurance, and the regional hospital boards and local medical committees of the National Health Service.

1. London: J. & A. Churchill. 1949. Pp. 2620. £3 3*s*.

University of Oxford

On Friday, June 10, Lord Boyd-Orr, F.R.S., will deliver the Herbert Spencer lecture in the divinity school at 5.15 P.M. His subject is to be the Third Major Transition Phase in the Evolution of Human Society.

Merton College.—Prof. Wilder Penfield, F.R.S., director of the Montreal Neurological Institute and sometime Rhodes scholar of the college, has been elected to an honorary fellowship.

Department of Surgery.—On Wednesday, May 18, at 5 P.M. at the Radcliffe Infirmary Dr. Franc D. Ingraham (Harvard) will deliver a lecture on Neurosurgical Problems of Childhood.

University of Cambridge

On April 23 the degrees of M.B., B.CHIR. were conferred on Muriel E. Sidaway.

Royal College of Physicians of London

At a comitia of the college held on April 28, with Lord Moran, the president, in the chair, the following were elected to the fellowship:

J. G. HISLOP, Australia; C. E. KELLET, Newcastle-on-Tyne; A. J. HAWE, Africa; E. MILDRED CREAK, London; G. S. HALL, Birmingham; L. H. HOWELLS, Cardiff; G. H. JENNINGS, Edgware, Middlesex; D. C. BELL, London; E. WYN JONES, Liverpool; R. A. JONES, Newmarket; A. W. MORROW, Australia; W. W. SARGANT, London; ALEXANDER KENNEDY, Newcastle-on-Tyne; C. A. CLARKE, Liverpool; CICELEY D. WILLIAMS, Switzerland; E. G. SAYERS, New Zealand; E. P. SHARPEY-SCHAFER, London; M. L. THOMSON, Manchester; R. W. MUSSEN, surgeon-captain, R.N.; E. M. BUZZARD, Oxford; F. D. HART, London; M. C. G. ISRAËLS, Manchester; E. W. HART, London; HOWARD NICHOLSON, London; HELEN E. DIMSDALE, London; W. E. GIBB, London; J. D. N. HILL, London; SAMUEL ORAM, London; H. W. FULLERTON, Aberdeen; T. A. KEMP, London; J. A. FRASER ROBERTS, London; HASHIM AL-WITRY, Iraq; CATHERINE CHISHOLM, Manchester; A. D. GARDNER, Oxford; S. A. SMITH, Australia.

The following, having satisfied the censors' board, were elected to the membership:

Cecil Abraham, L.R.C.P., P. G. Arblaster, M.B. Lond., Michael Atkinson, M.B. Lond., G. M. Bailey, M.B. Lond., A. J. Barnett, M.D. Melb., F. A. Binks, M.D. Lond., A. C. Boyle, M.B. Lond., P. T. Boyle, M.B. Camb., Jackson Braham, M.D. Leeds,* T. M. Brand, M.B. Manc., Hugh Brebner, M.B. Aberd., H. G. Bremner, M.B. N.Z., F. K. Bush, M.B. Melb., lieut.-colonel, R.A.M.C.,* I. W. Caldwell, M.B. Aberd., major, R.A.M.C., D. G. Cameron, M.D. McGill, R. H. Caughey, M.B. N.Z., P. J. R. Challen, L.R.C.P., Satya Saran Chatterjee, M.B. Patna, J. B. Cook, M.B. Lond., J. P. Currie, M.D. Glasg., KeshavaRao KrishnaRao Datey, M.B. Bombay, I. M. P. Dawson, M.B. Camb., I. S. Eve, M.B. Camb., E. L. Feinmann, M.B. Manc., Jack Fielding, L.R.C.P., J. W. B. Forshaw, M.B. Camb.,

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* In absentia.

Licences to practise were conferred upon the following 148 candidates (120 men and 28 women) who have passed the final examination of the conjoint board:

D. I. Acres, H. J. Andersen, H. C. Anthony, G. K. Barker, Rosemary E. Barker, June E. Bartlett, B. J. Batt, J. D. Beecroft, B. S. Bendeth, C. A. B. Bernstein, Edmund Beswick, Margaret V. Bickerton, Anne M. Booth, Stanley Boydell, E. I. Brentnall, R. McL. Brown, Prem Buri, Rachit Buri, Sheila G. S. Burnie, J. L. Butler, Maria J. Cahn, K. J. M. Carruthers, R. H. Carruthers, Gerald Castle, P. R. Chalk, D. G. Chalmers, Elizabeth P. Chisholm, B. G. B. Christie, F. R. Coffin, C. J. Cohen, P. B. Cook, B. E. D. Cooke, Cecil P. Cotterill, W. G. Dawson, V. W. M. Drury, Zakaria Mohammed El Asfoury, F. G. Ellis, C. M. W. Evans, A. R. Evason, C. H. Ewart, E. B. Farrar, Barbara J. Fleming, Mary A. Foley, B. J. Foster, Serem Freier, J. M. Frisch, S. I. Fung, E. J. Gammon, Alexander Gellert, Frances F. Gibbs, A. McD. Gillespie, H. J. Giwelb, Alexander Gol, P. M. Goodrich, N. D. Gower, J. R. Greaves, E. T. Griffiths, G. W. Hadfield, Geoffrey Hands, J. W. S. Harris, C. J. Hart, G. E. Heald, D. B. Henry, N. L. Higgins, F. J. Hine, E. R. S. Hooper, H. I. Howard, Margaret O. Hunt, Brenda James, June D. James, M. E. Johnston, J. A. B. Jones, Sylvia Kershaw, N. G. Kirby, M. D. Kochan, Ursula M. Kynoch, B. S. Laing, W. P. Lambie, J. M. Lancaster, P. F. R. Lankester, Stephanie M. Leese, R. C. Lemon, P. G. W. A. Lommerse, Joshua Lynfield, E. J. Mann, A. R. Maude, Dennis Mendel, Elisabeth Monkhouse, O. T. L. Morgan, Olive I. Munro, Joan R. Nichols, K. C. Nyman, H. D. Oliver, Paul Pearson, D. H. Pettigrew, A. H. Phillips, G. A. Phillips, Berwyn Plant, Sheila M. Pope, Betty E. Powe, Jill Prichards, Akaki Ramiszwili, D. D. J. Rees, B. B. Reiss, H. H. Richards, A. E Richardson, P. F. B. Riley, H. E. Roberts, J. D. Rodger, F. C. Rose, Melvin Rosenfeld, K. G. Rothwell, S. S. Rowell, J. L. Russell, D. E. Sargent, F. G. M. Seager, M. D. Shaerf, Margaret Sheldon, Katherine A. H. Smith, M. H. Southall, L. R. Spencer, Bernard Spiro, G. C. Squires, R. R. Steinert, J. A. B. Stewart, R. G. M. Stobie, R. A. Struthers, J. H. Swindell, A. W. Taylor, D. B. S. Taylor, J. B. Taylor, Rudra Datta Tiagi, Rita D. C. Tozer, J. D. G. Troup, G. N. Turner, P. M. Twist, Ellen Veldhuyzen, Thomas Wade West, John Warren, W. F. Wheeler, William Whittingham, G. A. Whittle, M. S. G. Worlock, Mary I. Wright, Ralph Wright, P. M. E. Youngman, Bessie C. Yule, Theodor Zondek.

Diplomas were conferred on those named in the report of the meeting of the Royal College of Surgeons (*Lancet*, April 16, p. 675) and on the following:

D.P.H.—P. L. Karney, D. F. van Zwanenberg.
D.C.H.—R. G. Dreadon.
D.T.M. & H.—S. A. Kotz.

Royal College of Surgeons of England

On Tuesday, May 17, at 4 P.M., Sir Edward Mellanby, F.R.S., will give a lecture at the college, Lincoln's Inn Fields, London, W.C.2, to commemorate the bicentenary of the birth of Edward Jenner. He is taking as his subject Jenner and his Impact on Medical Science.

Army Medical Directorate Renamed

The title of the Director of Hygiene at the War Office has been changed to Director of Army Health. This change applies also to deputy directors, assistant directors, and deputy assistant directors; and specialists in hygiene are now entitled "specialists in Army health."

British Tuberculosis Association

The association is holding a joint meeting with the North-Western Tuberculosis Society at the Medical Institution, Mount Pleasant, Liverpool, on May 27 and 28. The speakers will include: Sir Henry Cohen (Tuberculosis and General Medicine); Dr. R. Heller and Dr. C. H. C. Toussaint (Domiciliary Treatment of Pulmonary Tuberculosis); Dr. R. N. Walker (Tuberculosis in Seamen); and Mr. J. P. Heron (Rehabilitation in Surgical Tuberculosis).

Streptomycin for Europe

During its first year the United States Economic Coöperation Administration has financed the purchase of nearly $9 million worth of streptomycin for nations participating in the European Recovery Programme. France is now receiving about 500 kg. a month, while the Netherlands is using about 41 kg. a month; shipments have also been sent to Italy, Austria, and Greece. E.C.A. is financing more than $500,000 worth of American equipment so that two French plants near Paris may produce streptomycin.

U.S. Specialists to Review Tropical-disease Control

The Economic Coöperation Administration mission to the United Kingdom announces that Dr. Frederick J. Brady, of the U.S. Public Health Service, and Mr. Harry H. Stage, of the U.S. Department of Agriculture, are to visit British territories in East and West Africa to survey conditions affecting the control of trypanosomiasis and malaria, and to make recommendations for further U.S. assistance in combating the tsetse fly and mosquitoes. The project has been arranged under E.C.A.'s technical assistance programme.

M.R.C. Spectrographic Unit

By arrangement with the London Hospital, the Medical Research Council have established there a spectrographic research unit under the direction of Dr. E. R. Holiday. The primary function of the unit is to undertake original research in the field of absorption spectrophotometry as applied to biological problems of medical interest; but advice and assistance will also be given to other branches of the council's organisation using such methods. The unit has been based on the spectrographic department originally established by the London Hospital, and during the last five years partly supported by the council for the purposes now being developed.

National Association for the Paralysed

The British Council for Rehabilitation has lately set up a department to be concerned with the care, treatment, and rehabilitation of the paralysed. One of the first aims of this new department is to compile a list of those who are affected; and all those who are in touch with someone who is paralysed are asked to bring this idea to their notice and urge them to send their names and addresses, together with a note stating the type of paralysis from which they suffer, to the registrar of the association, 32, Shaftesbury Avenue, London, W.1. If the number of names submitted warrant it, a questionary will then be sent out from which it is hoped to extract information about the conditions and problems of paralysed people.

Charities Ball

The Metropolitan counties branch of the British Medical Association are holding a ball at B.M.A. House, Tavistock Square, London, W.C.1, on Thursday, May 26, at 8.30 P.M., in aid of medical charities. Further information may be had from the secretary of the ball committee at that address.

Return to Practice

The Central Medical War Committee announces that Dr. A. W. J. Houghton has resumed civilian practice at Drapers Hall, Shrewsbury.

Dr. Margaret Tod, deputy director of the Holt Radium Institute, Manchester, is visiting Italy this month to discuss with Italian radiotherapists preparations for the International Radiological Congress to be held in England in 1950. She is also lecturing on behalf of the British Council in Milan, Bologna, Florence, and Rome.

Dr. H. McD. Walker and Dr. T. F. Cotton have been appointed chevaliers of the order of the White Lion by the president of the Czechoslovak Republic.

Dr. Eliot Slater has been appointed a member of the Royal Commission on Capital Punishment.

CORRIGENDUM: *Ulcerative colitis.*—In our leading article last week the surname of Dr. S. A. Portis was wrongly given as Porter.

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MAY 14, 1949 PAGES 807 TO 848

THE LANCET

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THE ORIGIN OF PLACENTAL TROPHOBLAST AND THE FUNCTION OF PLACENTAL GONADOTROPHIN

ISRAEL GORDON
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THE purpose of this paper is to present for discussion and experiment an entirely unorthodox view of the origin of the main portion of placental trophoblast—namely, that it is formed from the follicle cells that surround the ovum when it leaves the ovary.

So far as I am aware, this theory has not been published before, but there can be no doubt that many must have considered it, and discarded it for what seemed very good reasons, the chief of which is that the follicle cells are desquamated from the ovum in its progress down the uterine tube. Had any still had doubts, the discovery of hyaluronidase in the spermatic fluid would probably have removed them. A third reason perhaps is that the very formidable indirect evidence that placental trophoblast is of granulosa-cell origin comes largely from the ancillary sciences of pathology, endocrinology, and cancer research, the students of which have such respect for embryologists that they have been unwilling to disbelieve one of the fundamental tenets of that science. Nevertheless I am convinced that, when this indirect evidence is fully marshalled and adequately presented there will be no-one who will not realise the necessity for a full discussion of the whole subject, even if not convinced of the truth of the hypothesis.

In this paper the term "trophoblast" is not synonymous with the trophoblast of Hubrecht, who applied the term to the outermost covering of the blastocyst. (This structure I call chorionic epithelium or ectoderm.) By trophoblast I mean the invasive element of many mammalian placentæ, including the cytotrophoblast of Langhans and the syncytium.

The fœtal origin of placental trophoblast has been settled apparently for about fifty years or more, and does not seem to have been queried since, except by Bostroem (1926), a pathologist. When the subject was still under discussion the theories were numerous. Waldeyer (1890) presented them in ten groups of different combinations of tissues. They were also summarised by Nevinny (1929), Robinson (1904), and Webster (1901). Maternal structures under consideration included surface endometrium, glandular epithelium, connective tissue, and vascular endothelium, but apparently never follicular cells from the graafian follicle.

The Evidence

The evidence I shall present here is subdivided as follows:

(1) The production by follicle and trophoblast of similar hormones.
(2) The hydatidiform mole and the independence of the trophoblast.
(3) Chorionepithelioma and its independence of a fertilised ovum.
(4) The ovarian reaction in hydatidiform mole and chorionepithelioma.
(5) The inherent property of granulosa cells to proliferate as tumour tissue.
(6) The phylogeny of the graafian follicle.
(7) The analogy of the functions of the follicle cells and the trophoblast.
(8) Ontogeny and phylogeny.
(9) The histological dissimilarity of the cytotrophoblast and the chorionic epithelium in man.
(10) The similarity of granulosa cells and cytotrophoblast in culture.
(11) The unusual placenta of the hyracoidea.
(12) The transplantation of tissues and the evidence of blood-groups.

PRODUCTION OF SIMILAR HORMONES

Œstrogen.—It is generally accepted that both the placenta and the ovary secrete œstrogens. There has been some doubt about the source of œstrogens in the ovary, Mossman (1937a) denying the conventional opinion that it is formed by the follicular cells and suggesting it to be a product of the theca interna. There can, however, be no doubt that granulosa cells (fig. 1) secrete œstrogens, in view of the fact that animals with experimentally induced granulosa-cell tumours are often in continual œstrus (Furth 1946). Allen (1941) suggests that granulosa, follicular, interstitial, or luteal cells may secrete this hormone, but that the follicular epithelium is probably the primary source. In any case, from the point of view of the hypothesis presented here, this difference of opinion is of little significance, since the theca interna and granulosa have the same embryological derivation (Novak 1947). Allen et al. (1925) first showed that the placenta secreted œstrogens, and in pregnancy it is the main source of them. Wislocki and Bennett (1943) suggest that the syncytium is the tissue concerned.

Progesterone.—It is generally accepted that progesterone is secreted by the corpus luteum, but Rock (1946) has also suggested that the theca interna is the site of origin. Courrier et al. (1929) pointed out that the placenta also elaborated progesterone, and Wislocki and Bennett (1943) again suggest the syncytium as its source. Much of the evidence that the placenta forms these two hormones is that their production continues in pregnancy after ovariectomy (Hartman 1937, 1941, Newton 1938). Haterius (1935) has shown just how much placental tissue is required in the rat to allow the continuation of pregnancy.

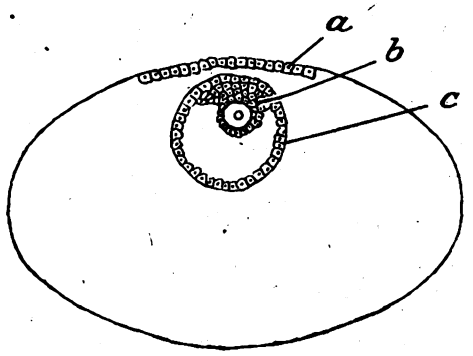

Fig. 1—Graafian follicle: *a*, germinal epithelium; *b*, ovum in cumulus oöphorus; *c*, granulosa cells.

Androgens are produced by the ovary (Lipschütz 1932) and probably by the placenta (Burrows 1945). The secreting tissue in the placenta is uncertain; once more the theca interna has been the source suggested in the ovary (Hernandez 1943).

Placental gonadotrophin is generally accepted to be a secretion of the chorion: hence its name "chorionic" gonadotrophin. It is not secreted, so far as is known, by any tissue in the ovary, and so might be held to disprove the suggestion that granulosa and trophoblast are related. However, the tendency now, with formidable evidence, is to deny that this hormone is a secretion of the trophoblast. Fellner (1933) apparently first suggested that the uterine mucosa in the maternal part of the placenta of the gravid guineapig secreted an anterior-pituitary-like hormone. Catchpole and Lyons (1934), in quantitative studies in the mare, in whose placenta the fœtal and maternal portions can be cleanly separated from each other, found that the hormone occurred in enormous quantities in the fertile endometrium and its secretion, none in the fœtus, and little in the fœtal membranes. Cole and Goss (1943) have carried this work further and demonstrated special modifications of the endometrium, called endometrial "cups," which are undoubtedly the main source of the hormone in the mare. The concentration of hormone in the cups is 50–900 times that in the

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chorion, and moreover the secretion from the cup contains 10–30 times the amount of hormone in the cup tissues. It is recognised that gonadotrophin of the pregnant mare is not identical with human pregnancy hormone, but Wislocki and Bennett (1943) point out that the decidua in the neighbourhood of the monkey placenta is positive for gonadotrophin. Burrows (1947) declares that the term chorionic gonadotrophin was

> "adopted in the past because of a hypothesis which later work has not confirmed. . . . Known facts do not support such a belief. . . . In the mare placental gonadotrophin is elaborated without a doubt by maternal tissues and not by the chorion of the fœtus. Although the precise origin of placental gonadotrophin has not been determined in every mammal, the process is a fundamental one and is likely to be the same in all."

He suggests the term "placental" gonadotrophin. It is only fair to point out that Jones et al. (1943) claimed that trophoblast in culture formed gonadotrophin. In this regard one would like to be certain that no decidua cells were included in the culture, and that the hormone produced was placental gonadotrophin and not pituitary type, which occurs in all sorts of tissues, such as various kinds of tumours (Hamburger 1933).

HYDATIDIFORM MOLE AND INDEPENDENCE OF TROPHOBLAST

Were the trophoblast part of the fœtus, it would be only natural to expect that the death of the embryo or fœtus would imply the death of the trophoblast. Such is not the case however, the trophoblast tissues apparently having a quite independent existence. For example, in tubal pregnancy, after the death of the embryo the trophoblast may remain functionally active and continue its erosive invasion for some time (Novak 1947). In a pregnancy, trophoblast alone may be found (Bonney 1943). The hydatidiform mole presents no problem if one considers that the trophoblast is of maternal origin; for, should the fœtus die, or only the vascular core of a villus cease to function, a cyst-like structure will arise owing to the inability of the dead or damaged core to carry away the secretions of the trophoblast. Hewitt (1860) first suggested this explanation without apparently realising that the two types of tissues might be from different individuals. Hertig and Edmonds (1940) point out how common hydatidiform degeneration is, for it occurs in 40% of all spontaneously aborted ova, or 4% of all pregnancies. They also state that 66·9% of diseased ova show early hydatidiform degeneration, and the younger and more diseased the embryo, the higher the incidence of hydatidiform degeneration. They add:

> "When the embryo is absent, dies early, or is very defective, the chorion keeps on growing and developing to some extent before the absence or the death of the embryo is biologically perceived by the maternal organism."

Finally, should the fœtal circulation be functioning normally but the trophoblast hypersecreting, hydatidiform degeneration may again be expected if the vascular core cannot carry away the secretions of the trophoblast. Perhaps this is the type of mole that tends to become malignant.

CHORIONEPITHELIOMA

This strange tumour presents many unique properties. Though it is universally recognised to be a malignant change of the trophoblast, it can be formed without fertilisation of the ovum. For instance, Loeb (1911) found that 10% of all his guineapigs showed parthenogenetic development of ova within the ovary, and the later stages resembled chorionepithelioma. Dougal (1924) described a case, and collected ten others from the literature, of primary chorionepithelioma of the ovary in women. Of fundamental import is the existence of a follicular cyst in the centre of the tumour he described. In none of the cases was any other fœtal tissue present. In view of this fact, which did not suggest a teratomatous origin, he postulated ovarian pregnancy. I suggest that these and similar cases are merely instances of metaplasia of the granulosa. Chorionepithelioma also occurs in old women, virgins, and men (Bostroem 1926) and is then explained away by the magical use of the word teratoma, even if no other teratomatous tissues are present. It was these anomalies that induced Bostroem to postulate first a maternal origin of chorionepithelioma, and, as a corollary, a maternal origin of placental trophoblast. His solution was that the trophoblast arose from undifferentiated mother-cells of the mesenchyme in the vicinity of blood-vessels. Nevinny (1929) pointed out the defects of this conclusion but nevertheless, from extensive histological investigation, claimed that part of the tumour, both in its primary and metastases, was of maternal origin, that part being a mantle of cells round the blood-vessels.

OVARIAN REACTION IN HYDATIDIFORM MOLE AND CHORIONEPITHELIOMA

Though the development of hydatidiform mole and chorionepithelioma strongly suggests that the trophoblast is of maternal origin, these tumours do not prove any relation between ovarian tissues and the trophoblast. A fascinating clue exists, however, in the occurrence of multiple ovarian lutein cysts in cases of chorionepithelioma and hydatid mole—in 91% and 80% respectively (Coventry 1920). Novak and Koff (1930) put the incidence as less, but pointed out that the ovarian cysts may reach enormous size or show little or no gross enlargement. They postulated, however, a "hyperreaction luteinalis" in every case of hydatidiform mole and chorionepithelioma. Should trophoblast and lutein tissue have the same origin, it is not surprising that a stimulus to the one tissue also causes proliferation of the other. Novak (1947) shows that the tissue in the ovary that reacts thus may be either thecal or luteal tissue.

INHERENT PROPERTY OF GRANULOSA CELLS TO PROLIFERATE AS TUMOUR TISSUE

The fate of the granulosa cells extruded with the ovum is usually ignored. Robinson (1904) stated that the corona radiata (fig. 2) soon disappears; the cells are cast off and degenerate. Speculation on the function of the corona radiata has been scanty. It has been suggested that these cells are used as food for the ovum or to ensure egress of ovum from follicle. Squier (1932), however, has reported some remarkable facts:

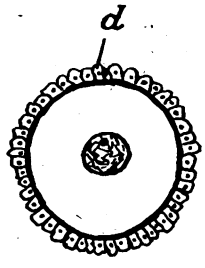

Fig. 2—Extruded ovum with corona radiata (*d*) not yet desquamated.

> "Cumulus cells disappear from the egg (of guineapig) not by primary disintegration or autolysis but as distinct cells which become loosened in attachment and then fall off. Lewis, in this laboratory, has cultured in vitro the granulosa of some of these guineapig ovaries. She finds characteristics which indicate that granulosa cells are not far removed from tumour cells in certain properties. They have great power of liquefaction of the plasma coagulum in which they are cultured."

The power of liquefaction of plasma coagulum by sarcoma cells was shown by Drew (1922). That this property in culture of the granulosa cell is of great significance has recently been abundantly confirmed. Biskind and Biskind (1944), Li and Gardner (1947a, b, c), Lipschütz (1946), and Peckham et al. (1948) have shown in rats, mice, and guineapigs that, if the animal is castrated and the ovary or part of it is transplanted to the spleen or the pancreas, malignant granulosa-cell tumours eventually arise, which tumours metastasise and

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can easily be transplanted to other castrates and less easily to recipients that have not been castrated. The mechanism is that the pituitary gland hypersecretes its gonadotrophin because it is no longer under control of œstrogens, for the animal is castrated and the œstrogens from the transplant are destroyed in the liver. The mechanism is believed to be similar in those cases where ovarian tumours have been induced in mice by X rays (Furth and Boon 1947, Furth 1946, Traut and Butterworth 1937). Be it noted that, though an excess of gonadotrophin is necessary to start the hyperplasia, in some cases the transplants continued to grow in normal animals. The suggestion of Li and Gardner (1947d) that the granulosa-cell tumour has arisen from granulosa cells developed in the transplant from germinal epithelium in no way challenges the conception.

In man some of the largest cysts in the body are ovarian. There is as yet no certainty as to the origin of the lining cells of these cysts, but MacLeod (1934) makes a good case for considering them to have originated from the graafian follicle.

What is the reason for this potentiality of the granulosa cell under stimulus from gonadotrophin? I submit it is that this cell, under a similar stimulus but in a different place, will proliferate to form the trophoblast of the placenta.

PHYLOGENY OF GRAAFIAN FOLLICLE

The graafian follicle of all vertebrates except mammals is solid throughout and devoid of any trace of follicular fluid (Flynn and Hill 1939). It is only in the mammalia that this fluid appears, and only in the higher mammals that it is formed in such a position that the granulosa is divided into two portions, one to remain in the ovary, the other to be extruded with the egg (fig. 1). This type of follicle seems to have arisen precisely in phylogeny with the development of invasive trophoblast. Thus the monotreme a primitive egg-laying mammal with no placenta, also has this fluid, but it is secreted between the inner surfaces of the follicular cells and the zona pellucida and completely surrounds the oöcyte. Flynn and Hill (1939), who describe this, assert that it is the homologue of the liquor folliculi of other mammals. The marsupials have a variety of placentæ, some complicated (Robinson 1904). However, the opossum, an American marsupial, has a very simple placenta separated from maternal tissues by a shell-membrane (Hartman 1919). It is of interest that the opossum is one of the only two mammals whose egg has no corona radiata (Hartman 1939). So far as the present hypothesis is concerned, the placenta of the opossum does not require the presence of a corona radiata, because it has not, nor apparently ever had, an invasive trophoblast. The other exception, the sheep, is discussed below.

ANALOGY OF FUNCTION OF FOLLICLE CELLS AND TROPHOBLAST

One of the main functions of the follicular epithelium —i.e., the transmission and elaboration of the materials used in the growth of the oöcyte (Flynn and Hill 1939)— is of relatively little significance in the higher mammals, where the egg is extruded from the ovary in a minute form. But in many egg-laying vertebrates the condition is otherwise. For instance, the ovarian egg of the hen grows to a large size, and the follicular layer surrounding it is well developed and vascularised. In fact, it might loosely be termed an ovarian placenta. Is it then so strange that, when in the course of evolution the fertilised egg is transferred to another organ of the mother for further development, the identical cells should be utilised for the embryo's nourishment and protection? Further, is it not then natural that these cells should continue to secrete the same hormones that they secreted while in the ovary; and that, until they are sufficiently well established in the uterus, the graafian follicle should develop into a large gland, the corpus luteum; and that, when they are well enough established in the uterus, the original gland in the ovary should in some animals be dispensed with?

ONTOGENY AND PHYLOGENY

The theory of recapitulation is now somewhat under a cloud. With its original and popularly understood form, that each individual recapitulates in somewhat the same order the morphology of the ancestors, the existence of the trophoblast, if fœtal in origin, is in direct conflict. For the trophoblast is the first functioning organ in many animals, such as the primates, functioning when the rest of the embryo is still an inner cell-mass. Yet in the history of the race it is the last major organ to develop, being found only in the higher mammals.

However, this simple form of the theory of biogenesis has undergone modification. Von Baer in his fourth law, quoted by de Beer (1940), stated that "the young stages in the development of an animal are not like the adult stages of other animals lower down on the scale, but are like the young stages of those animals." The conventional theory of the trophoblast does not fit in with this, since the mammalian trophoblast resembles nothing in the young stages of other animals. Haeckel, who was responsible for the pure view that early stages of animals recapitulated adult stages of their ancestors, had to introduce a term, cænogenesis, to define, but not to explain, the fact that a developing animal presents shapes and structures which no adult ancestor could possibly have possessed, such as fœtal membranes. The modern theory as expressed by de Beer is adapted to meet all exceptions, so can be held as evidence for nothing. He states: "Cænogenetic adaptation proves that evolutionary novelties can and do appear in the early stages of ontogeny."

In spite of all this it does seem that serious consideration should be given to a hypothesis that affirms that a structure, though the first to develop in ontogeny, is the last in phylogeny. It is strange that this fact has very rarely troubled students of the placenta. It is true that Hubrecht (1908), Beard (1896), and Annett (1933 personal communication), perhaps worried by this, have postulated that the mammalian trophoblast can be compared with the larval envelopes of some worms, but these workers were undoubtedly referring to that structure which, for the purpose of this paper, is called chorionic ectoderm.

HISTOLOGICAL DISSIMILARITY OF CYTOTROPHOBLAST AND CHORIONIC EPITHELIUM IN MAN

Since it is usually accepted that the so-called cytotrophoblast and the wall of the blastocyst are the same tissue, it would not be unreasonable to expect the cells to look alike. However, Ramsey (1937,1938) and Dible and West (1941) point out that they are different in the early previllous stages (fig. 4). Dible and West divide the cytotrophoblast into central and peripheral portions, of which the former is the true wall of the blastocyst. The cells of the peripheral portion are "larger, have more clearly defined walls, and nuclei generally are not so darkly stained and do not take up so much of the cell."

IS THERE ANY MORPHOLOGICAL SIMILARITY BETWEEN GRANULOSA CELLS AND CYTOTROPHOBLAST?

Corner (1945, 1946) points out, in the monkey and other mammals, a change in appearance in cells of the cumulus oöphorus just before ovulation. The nuclei become pyknotic, the cytoplasm shrinks, and the cells hang together by delicate cytoplasmic strands. Corner interprets this change as a sign of decadence, though he says a similar but less marked change takes place in the entire granulosa, which is far from degenerate and shortly

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to become converted into luteal cells. Surely the morphology of a cell varies somewhat with its function, and the true function of the cumulus cell is in abeyance between ovulation and embedding in the endometrium. If the granulosa cell is grown in culture it becomes spindle-shaped or spidery (Pincus 1930, 1936). The trophoblast cells in culture have a similar tendency (Wislocki and Bennett 1943, Jones et al. 1943).

UNUSUAL PLACENTA OF HYRACOIDEA

If the trophoblast is of fœtal origin, it would not be unreasonable to suppose that it should have some organic attachment to the fœtal tissues, more so than to the maternal. Wislocki (1930) describes an unusual placenta in hyrax:

> "There is a marked invasion of the endometrium by trophoblast . . . the chorionic mesoderm is extremely slow in invading the trophoblast . . . and the union of mesoblast and trophoblast only very slight. This can be appreciated by the fact that grossly the mesoblast can be separated from the trophoblast by gentle traction. Under a Greenough binocular dissecting-microscope the mesoblastic membrane so removed is seen to be covered by short unbranched villi which fit into corresponding crypts or pits in the trophoblast. The trophoblast, on the other hand, resists separation, at this period clinging to the uterine wall as though it were an integral part of the latter and not of fetal origin."

TRANSPLANTATION OF TISSUES AND EVIDENCE OF BLOOD-GROUPS

The trophoblast, if of fœtal origin, must be considered as the transplant of another individual into the mother, since it normally invades the maternal tissues. It is of interest to review the usual fate of transplants. Neuhof and Hirschfeld (1923) declared that transference of skin from one person to another will succeed only if the persons are in the same blood-group. Infants are very often of a different blood-group from the mother. Neuhof and Hirschfeld also stated that the higher in the scale of evolution the less likely are transplants to take. Placentate mammals are supposed to be in the highest grade. Romanis and Mitchiner (1948) are even more pessimistic; they state that grafts must come from either the patient or an identical twin, and that it is impossible to obtain a permanent take from any other person, even of the same blood-group. The results of embryonal transplantation are much more favourable than those of adult tissues, but even transplanted embryonal tissues do not continue indefinitely: a stationary period is reached, and finally much or all of the transplant disappears (Neuhof and Hirschfeld 1923). Embryonic transplants will only take if donor and host are inbred and homozygous (Gye 1949). Actually, the recipient becomes specifically immune to tissues grafted from another person, and the grafts are destroyed when vascularised, and not, as formerly thought, because they were not vascularised (Medawar 1948). Trophoblast flourishes in the mother, in intimate contact with her blood-stream, and without benefit of cross-matching of blood-group.

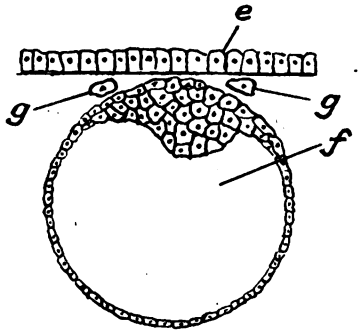

Fig. 3—Blastocyst (*f*) before embedding in endometrium (*e*): *g*, desquamated follicle cells which, if unattached (as shown), would almost inevitably be washed away in preparation of specimen for inspection, but, if attached to blastocyst, would be accepted as of fœtal origin.

The group-specific substances ABO are found not only in the red blood-cells but also in all tissue cells of the body (Whitby and Britton 1946), therefore presumably in the trophoblast, though from a search of the literature it does not seem that anybody has specifically examined the trophoblast in this connexion. Since trophoblast emboli are found in the lungs of 80% of women in normal pregnancy (Schmorl cited by Sears 1933) and in the musculature of the normal uterus, one would expect to find, in every case where the fœtus has an agglutinogen not possessed by the mother, that the mother develops increasingly the corresponding agglutinin. Boorman et al. (1945) found that in 8 out of 44 cases of this so-called heterospecific pregnancy agglutinin titres did not rise. Smith (1945) found that 6 out of 46 did not show increasing antibodies. Smith showed that in those cases where the mother did not react the fœtus was a "non-secretor"—i.e., water soluble agglutinogens were not in its fluids and so could not cross the placental barrier to the mother. As the trophoblast emboli in the mother are said to be fœtal in origin, the mother should react whether water-soluble agglutinins are present in the fœtus or not. If the mother reacts to hetero-specific antibodies in a non-secretor child, the infant should have erythroblastosis, if the theory of Boorman and Dodd (1943) that agglutinogens in the tissue fluid only can protect from antibody from the mother is true. The same workers have shown that erythroblastosis can result from ABO incompatibility in rare cases (Boorman et al. 1942). If the trophoblast is of fœtal origin, these cases should surely be much more common.

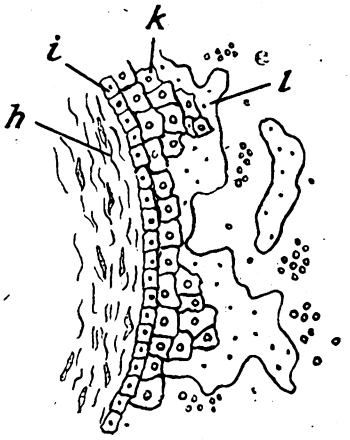

Fig. 4—Early previllous embryo: *h*, chorionic mesoderm; *i*, chorionic ectoderm; *k*, cytotrophoblast; *l*, syncytium.

THE MECHANISM

The facts hitherto discussed, though they strongly suggest that the trophoblast and granulosa are related, are but indirect evidence, and it is necessary to consider the observed facts of the fate of cumulus cells and ovum in tube and uterus to ascertain if there is any possibility of the hypothesis being true. The first fact to be considered is the observation by many workers that the granulosa cells fall from the ovum at an early stage, a matter of hours, after ovulation. Pincus and Enzmann (1932, 1936), Pincus (1930, 1939), Lewis and Wright (1935), and Hamilton (1944) describe the phenomenon in detail. Some of this work is open to the following criticism:

(1) Falling away of the cumulus cells does not apparently mean that all the cells are desquamated. For instance, Pincus and Enzmann (1932) state that in the rabbit the massed follicular cells had fallen away, but their illustrations show that nevertheless some cells remained. A photograph shows only one plane; careful examination of all the surfaces of the sphere of an ovum may disclose even more adherent cells. Should only one cell be left behind it would suffice to form a trophoblast.

(2) Much of the desquamation is an artefact. The ovum can only be examined in two ways: (*a*) by washing it out of the tube, and (*b*) by examining it in situ after fixing and embedding. As regards (*a*), Lewis and Wright (1935) repeatedly mention the washing off of corona cells in this manipulation. Rock and Menkin (1944) describe the dropping off of the cellular investment during pipetting. As regards (*b*), Hamilton (1944) describes in the human ovum the loss of cumulus cells in fixation and dehydration. Lewis and Wright (1935) suggest

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that the fixative dissolves the zona pellucida. Gregory (1930) mentions the difficulties of fixing, embedding, and cutting. Allen et al. (1930) describe follicle cells round an ovum which were later dispersed in dehydration and embedding.

(3) Conditions in vivo, where perhaps the granulosa cells are subject to hormonal stimulation, are not similar to those in the fluid vehicle in which these cells are examined in vitro, where temperature, chemistry of medium, and oxygen and carbon-dioxide content are different (Pincus 1930).

(4) If the eggs are artificially fertilised in vitro they are subject to a much higher concentration of spermatic fluid than would be the case if fertilisation took place in the tube, and the degree and speed of dispersion of the cumulus mass is roughly proportional to the sperm concentration (Pincus and Enzmann 1936).

The purport of all this is that, though falling away of the cumulus does occur, nevertheless the process has been much exaggerated.

It can be shown that in at least one animal, the rabbit, desquamation must occur; for in this animal a thick albuminous layer, said to be secreted by the lining membrane of the tube, is laid round the ovum. Obviously, if any cumulus cells remain they must be imprisoned within this thick albumin layer and would have been disclosed by the extensive study that the ovum has had. But a study of the early development of the rabbit embryo shows that even if all the follicular cells are shed they would still be in a position to form the trophoblast. Briefly, in the rabbit (Chipman 1903) the embryo does not embed itself in the tissues of the uterine cornu until a comparatively late stage, by which time a primitive streak and groove are visible and the blastocyst occupies the whole space of the gestation cavity. It has presumably survived on the nourishment provided by the albumin covering. Then, and not until then, the trophoblast develops and starts invading the maternal tissues. It is thus apparent that the cumulus cells, of which there is ample supply in the rabbit, with a volume many times that of the eggs, as they travel down the uterine cornu must be entrapped between the enlarging blastocyst and the uterine wall, and thus be in the precise position required of them if they are to form a trophoblast. It is apparent that such a mechanism cannot apply to the larger mammals, with different forms of placentation and embedding. Further, in large mammals, though the ova are comparable in size with the ova of smaller animals, the tubes are vastly larger: thus a marrying-up of an ovum with detached cumulus cells is apparently much less probable. Moreover the corona radiata of some of these mammalian ova is much sparser (Hartman and Corner 1941). Nevertheless consider a remarkable observation by Hartman (1939):

> "In the uniparous monkey and man the site of implantation is fairly well fixed . . . the monkey ovum implants regularly within a radius of two or three millimetres to either side of the midline, some four or five millimetres from the fundus margin of the uterine horn."

The same worker brings forward evidence that uterine currents, either muscular or ciliary in origin, direct the blastocyst to this place. If this happens, surely it is not a wild assumption that corona radiata cells, if desquamated, are directed to the same spot by the same currents? There is another very interesting observation by Wislocki and Streeter (1938) on the early placentation of the macaque. The earliest sign of proliferation of the trophoblast in their specimen appears in a coronal path round the inner cell mass—i.e., encircling the embryonic pole of the ovum, where it is in contact with the endometrium. These workers can apparently offer no explanation for this; if, however, the desquamated follicular cells which should form the trophoblast were to be in a position where they are in contact with both the surface of the blastocyst and the endometrium, this circular path is the only site available for them (fig. 3).

The fate of the follicle cells has been neglected in most observations, but in various papers there is a mention of cellular "debris" as of something hardly worthy of attention. Allen et al. (1930) describe it in washing out of the tubes in women, Clark (1934) complains that this cellular debris makes it difficult to find the sheep's ovum. Squier (1932) notices these cells in the debris of the washings from the cornu of the guineapig uterus. It is apparent that these cells are considered as something necessary to get rid of, since they spoil a tidy picture. It is no cause for wonder then that in illustrations of ova before formation of a trophoblast they are absent. When the earliest stages of the formation of the trophoblast are present, and proliferating cells are seen, they are universally accepted as having arisen from the chorionic ectoderm, whereas they might easily be this neglected cellular debris only now worth attention because attached to the blastocyst. Heuser and Streeter (1941) illustrate a stage further in the implantation of the macaque embryo. There are present cells of the chorionic ectoderm, and cells lining the endometrium and, in between, some cells that apparently cause some mystification; they consider them to be nuclei of the endometrium which have "slipped down" out of the uterine endometrium. I suggest that these are proliferating follicular cells. When the previllous human embryo is fully embedded, the morphological distinction between chorionic ectoderm and trophoblast still persists, as discussed above. In later stages of the placenta various layers may disappear—e.g., the cytotrophoblast in the human placenta, and both layers of trophoblast in other mammals—thus giving rise to an appearance that may confuse the issue.

Angiogenesis.—Hertig (1935) and Gladstone and Hamilton (1941) have said that the trophoblast takes part in the formation of the mesoderm and blood-vessels of the villus. Provided it is realised there is a difference of terminology, in that what is described in this paper only as chorionic ectoderm is usually known as trophoblast, there need be no incompatibility or confusion. The chorionic epithelium, being fœtal, can still be available for angiogenesis.

Hyaluronidase.—Since Yamane (1930) observed that mammalian sperm carries an enzyme that denudes the ovum of its follicular cells, it has been generally accepted that one of the functions of hyaluronidase is to clear the ovum of surrounding cells so that it can be inseminated by the spermatozoa. This simple explanation is now known to be incorrect. Firstly, hyaluronidase is not primarily in the spermatic fluid but merely diffuses into it from the spermatozoa (Hechter and Hadidian 1947). It is this property of the sperm cell that enables it to make its way through the loose cellular formation surrounding the egg, as observed by Rock and Menkin (1944). Secondly, Leonard et al. (1947) have clearly demonstrated in the rat that sperm penetration precedes the gross denudation of the ovum, for after introduction of hyaluronidase into both uterine horns of 12 rats masses of ova were recovered in every instance 18–24 hours later, and not in one case were the ova denuded. Addition of the uterine fluid of these rats to their own ova in vitro induced complete denudation in 10–20 minutes. This suggests that denudation usually takes place in the uterus, perhaps after the ovum reaches its implantation site. There are many published reports of the tenacity of the cumulus cells in adhering to the egg. Pincus (1936) and Squier (1932) describe this, the latter stating that in eggs from the follicle the cells adjacent to the zona cannot be detached without injury of the zona. According to Allen et al. (1930) the cumulus of the dog is particularly adherent.

The Non-deciduate Placenta.—It has been suggested above that only the invasive trophoblast has arisen from follicle cells. It is apparent that every blastocyst must

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have its own lining chorionic ectoderm, and in placentæ where the relationship is that of a single layer of fœtal tissue apposed to a single layer of uterine epithelium there is neither place for nor need of any intervening tissue. Perhaps Robinson's (1904) division of placentæ into appositæ and conjunctæ is more descriptive of the position than the terms non-deciduate and deciduate. This is not to deny that such placentæ may not be complicated, with rugæ and villi, but the two layers nevertheless remain separate and often easily separable. The chorionic epithelial cell may send processes between the cells of the uterine lining epithelium but does not invade that tissue. Thus primitive placentæ, such as those of the viviparous reptiles (Weekes 1935), even though often complicated, are not included in this hypothesis. Neither is the simple placenta of the marsupial opossum. Most important of all, it does not include the epitheliochorial placenta of the ungulates, which is not a primitive type but perhaps is a secondary simplification of an endotheliochorial condition by a process akin to arrested development (Mossman 1937d). Thus the ungulate placenta may once have had an invasive trophoblast but has since lost it. Accordingly the statement by Hartman (1939) that neither the sheep nor the opossum ova has a corona radiata is of no significance in this connexion. Concerning this deduction a criticism might be raised that the mare is one of the animals in which the ovary may be removed without termination of pregnancy or cessation of excretion of œstrogens (Newton 1938). Since there is no trophoblast in the mare's placenta, how can this be explained? The answer is that œstrogen is secreted by the adrenals (Engelhart 1930). Parkes and Bellerby (1927) conclude that, in the cow, since œstrogen is found in exactly the same proportions in the maternal and fœtal portions of the placenta it is not elaborated but merely absorbed there.

Transference of Mammalian Eggs Fertilised In Vitro to Another Female.—Pincus and Enzmann (1934) describe how rabbit ova may be fertilised in vitro, how the surrounding granulosa masses fall away, and yet how, after transplantation to another female, 7 out of 10 of these ova give rise to young. It might be suggested that this disproves my hypothesis. However, it is not so, for the recipient does were mated with vasectomised bucks or infected with gonadotrophin to produce a condition of pseudopregnancy. This would cause ovulation in these does, and unfertilised ova with their cumulus cells would enter the tubes and uterine cornua, these cumulus cells being available for the ova fertilised in vitro. It is also not clear that, when Pincus and Enzmann state that the cumulus cells fall away there is certainty that none are left on any part of the sphere of the ovum.

Deductions

PLACENTAL GONADOTROPHIN

If the hypothesis presented is correct, a most important deduction can be made about placental gonadotrophin. It is generally accepted that the action of pituitary gonadotrophin is to give some sort of stimulus to the follicular apparatus of the ovary. If the trophoblast is derived from the follicular cells, it is most likely that the trophoblast cells will also be stimulated to growth by gonadotrophin. This assumption has been difficult to make before, since it is usually considered that placental gonadotrophin is secreted by the trophoblast; but, as shown above, this is unlikely, and human, primate, and equine gonadotrophin is probably secreted by the fertile endometrium. Pituitary and placental gonadotrophins have some differences in their actions, and this is because pituitary gonadotrophin is directed toward the ovary, and placental gonadotrophin has been directed toward the trophoblast. The necessity for stimulation of the trophoblast is apparent, for it has to proliferate pari passu with the embryo—in fact in the early stages even faster than the embryo. The embryonic tissues have an innate capacity for reproduction, but the trophoblast, being adult tissue, has not; hence the powerful stimulus of placental gonadotrophin. The capacity of the follicular cells to respond by extreme proliferation, even to cancer production, under gonadotrophin stimulation has been discussed above. This solves a very awkward problem that has been troubling endocrinologists about the function of placental gonadotrophin. Though it is poured out in vast quantities in pregnancy, no real function has yet been attributed to it. In fact the absurd position has been reached that Newton (1939) can state that it causes damage to the follicular system in women and monkeys, and Davis (1946) suggests that it does not affect the human female favourably and hence is probably of no value in gynæcological therapy. This is because attention has been directed toward the gonads instead of to the trophoblast. Thus in a true sense placental gonadotrophin is the pregnancy hormone, and its rational use is directed toward the maintenance of a healthy trophoblast.

To forestall criticism that in the mare the fertile endometrium pours out large quantities of gonadotrophin to stimulate a trophoblast that is not there, it must be pointed out again that the placenta of ungulates is probably a simplification of an earlier type that may have had a trophoblast which has since disappeared. The equine gonadotrophin is still required, however; and, since there is no trophoblast, its action is not like that of human gonadotrophin but is directed toward the ovaries and is thus pituitary hormone in type (Boycott and Rowlands 1938, Newton 1939). The result of this is that the ovaries of the pregnant mare have corpora lutea enlarged to such an extent as to resemble the ovaries of the human in chorionepithelioma (Catchpole and Lyons 1934). This hypertrophy is perhaps a necessity to make up for the loss of secretory activity of the trophoblast.

If the fertile endometrium is the source of pregnancy gonadotrophin, it remains to be explained how gonadotrophin comes to be secreted in cases of tubal and primary abdominal pregnancy, though Novak (1947) questions the possibility of most of these latter cases. It is well known that endometrial tissue occurs in the tube and in and round the pelvic viscera. Sampson (1926) elaborated the theory that retrograde menstruation causes the seeding of these areas by cells from the endometrium with implantation and growth. Novak (1947) reviews the evidence for the other theory, that the cœlomic epithelium generally may undergo metaplasia, and that, given suitable stimulation, peritoneal and tubular epithelium may be changed into endometrium. Southern (1948) has described peritoneal endothelial cells undergoing this change.

The question of source of secretion of gonadotrophin in ectopic chorionepithelioma must be considered. Nevinny (1929) has described a mantle of cells round the small vessels in the metastases of this tumour, which mantle is of local origin. It is suggested that these cells secrete gonadotrophin, if the pituitary gland and the endometrium of the uterus do not.

Though it has not apparently been previously suggested that trophoblast and follicular tissue are of the same origin, it is extraordinary how some workers have almost unconsciously been forced to accept this hypothesis without actually mentioning it. For instance, Boycott and Rowlands (1938) say:

> "Good results have been reported from the use of progesterone in cases of threatened abortion, but the stimulation of the luteal cells of the placenta to secrete progesterone, by the injection of extracts of gonadotrophic hormone, would appear to be a more rational method of correcting the physiological defect."

Browne and Venning (1936) make a similar suggestion.

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Newton (1939) affirms that the action of human gonadotrophin is the opposite of gonadotrophic, and that it may have some function connected with placentation. Finally, Kullander (1948), noting that stilbœstrol depresses the production of gonadotrophin by the pituitary gland, tried it in cases of chorionepithelioma, where the secretion of gonadotrophin is high. He did not cure his patients; but, so long as the stilbœstrol controlled the secretion of gonadotrophin, they improved. This suggests that gonadotrophin has some action on the growth of the tumour. If this be the case, the chorionepithelioma is the human analogue of the granulosa-cell tumours produced in the rodent by excessive secretion of gonadotrophin, and a grave warning will be required against excessive gonadotrophin therapy in pregnancy.

INFERTILITY

I suggest that, when the ovum and the follicular cells do not manage to keep together or to reunite, the blastocyst cannot form a trophoblast; hence pregnancy cannot take place. This may be one of the causes of infertility.

Experiments Suggested

To prove or disprove this theory by direct evidence will be difficult; if, as described earlier, cells are seen proliferating on the surface of the blastocyst, who is to say whether they are cells of the chorion or reattached follicular cells? However, the problem can be approached indirectly. Perhaps the neatest method would be to ascertain the agglutinogens of the trophoblast by absorption tests. If agglutinogens not present in the mother are found, the trophoblast must be of fœtal origin. (The mesodermic core of a villus is certainly fœtal in origin, so in order to be certain that this error does not arise, no fœtal mesoderm must be present. Probably the chorionepithelioma is the only tissue that meets this test.)

A further experiment would be to transplant follicular tissue to the uterine endometrium and stimulate it to growth with gonadotrophin. One would then expect, if the correct gonadotrophin (often a highly specific hormone) is used, to see trophoblast develop. Again an error will tend to creep in—i.e., the tendency of maternal endometrium to form a syncytium of trophoblast-like tissue. Hamilton and Gladstone (1942) describe this difficulty in man, and Hisaw (1935) and Mossman (1937b) denote how trauma of the maternal endometrium may give rise to syncytium almost identical with true syncytium. One is reminded of other evidence that the syncytium in some animals, such as perameles (Robinson 1904), is of endometrial origin. Perhaps the endometrium normally takes a greater part than is generally supposed in the formation of the trophoblast. Endometrium is derived from the primitive cœlomic epithelium. So is the follicular tissue (Mossman 1937c); hence such an occurrence would not be surprising if trophoblast is normally of follicular origin.

To substantiate the suggestion that the function of gonadotrophin is to stimulate the trophoblast, and to prove the theory of hydatidiform mole, the embryo might be destroyed in an animal whose placenta has two layers of trophoblast, preferably a primate, and large amounts of gonadotrophin, if possible specific to that animal, might be injected.

Summary

Attention is drawn to the extraordinary potentialities of the invasive trophoblast of the higher mammals. Though generally thought to be of fœtal origin, trophoblast is formed when there is no embryo, lives on after the embryo has died—e.g., in hydatidiform mole—and is found where there never has been any possibility of a fertilised ovum, as in chorionepithelioma in men, old women, and virgins. Though of fœtal origin trophoblast mimics the maternal tissues—i.e., the ovary and adrenals—by secreting œstrogens, progesterone, and androgens. It is said also to secrete a gonadotrophin analogous to that secreted by the adult pituitary gland and the endometrium of the pregnant mare. Though the first organ to be developed in the life of the individual, trophoblast is the last major organ to be developed in the phylogeny of the race. In the early stages of embedding it is morphologically dissimilar from the lining of the blastocyst, with which it is supposed to be identical. As a transplant to another individual—i.e., the mother—it grows without difficulty, though it is not a tumour; and, though often of different blood-group, it does not always stimulate the corresponding agglutinin.

All these difficulties are resolved if it is accepted that the invasive trophoblast is formed from the follicular cells that surround the ovum when it leaves the follicle. In the evolution of the graafian follicle a portion of the granulosa cells leaves with the ovum just at that time in phylogeny when an invasive trophoblast is developed. Further, the granulosa cells have an enormous potentiality to hyperplasia, even to cancer formation, under the stimulus of gonadotrophin. These cells and the placenta produce the same hormones and proliferate under the same stimuli—i.e., in normal pregnancy, hydatidiform mole, and chorionepithelioma. They have analogous functions, for the follicular epithelium provides for the protection and nutrition of the ovarian egg, and the trophoblast serves in a like capacity to the embryo. Since the follicular cells are maternal, no difficulty is found in interpretation when the trophoblast lives on after the embryo has died, or proliferates when there never has been an embryo. Neither are the difficulties inherent in transplantation of tissues or difference of blood-group of any relevance. The fact that the follicular cells are desquamated from the egg in the uterine tube does not exclude this hypothesis, for it is possible that much of the denudation is an artefact and a few cells may remain. Even if all the cells fall away, as in the rabbit, it is probable, and in the case of the rabbit almost certain, that they rejoin the blastocyst.

It is deduced that the function of placental gonadotrophin, which is probably formed in the fertile endometrium, is to stimulate the trophoblast, as other gonadotrophins stimulate follicular cells. A further deduction is that one of the causes of infertility may be the failure of blastocyst and follicle cell to reunite if previously separated.

Suggestions are made for experiments to help settle the issue.

It is emphasised that what has been suggested does not refer to the epitheliochorial placentæ of the ungulates, where a single layer of chorionic epithelium is opposed to a single layer of uterine epithelium.

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"... The care of the acute (short-term) and the care of the chronic (long-term) should be integrated in the general hospital on a continuing basis as long as the need for a hospital bed can be proved; the care of all others should be provided in their homes, or in the equivalent of their homes, by an extramural hospital program equal in service to the intramural hospital program. Under such a plan the bed in the patient's home comes as much under the protection of the hospital during illness as the intramural bed within the hospital."—Dr. E. M. BLUESTONE, *Med. Clin. N. Amer.*, March, 1949.

SPONTANEOUS HYPOGLYCÆMIA

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EXPERIENCE in outpatient departments and wards shows that doctors in this country do not appreciate the nature and incidence of spontaneous hypoglycæmia —i.e., hypoglycæmia occurring in the absence of injected exogenous insulin. Among the reasons for this lack of recognition are the absence of any complete account of the disease, its scant mention in most textbooks, and the difficulty of correlating the extensive and scattered reports, many of them foreign. Further, spontaneous hypoglycæmia has been overshadowed by a rare serious variety due to tumours of the islets of Langerhans, perhaps because this type was the first to be fully described and its obvious mechanism, severe manifestations, easier diagnosis, and surgical relief have tended to throw it into undue prominence.

I try here to clarify the position by simplifying the exhaustive classifications which tend to obscure the true picture of spontaneous hypoglycæmia, to indicate its incidence, and to examine the evidence on the mechanisms of the commoner types so as to aid their recognition and investigation.

CLASSIFICATION

The long lists of every possible cause for a lowered blood-sugar which too often do duty for "classification" are a great hindrance to a proper appreciation of the disease; most of the conditions mentioned in them are very rare as causes of hypoglycæmia, and many are entirely theoretical or depend on one or two doubtful cases for support —e.g., the association noted with renal glycosuria, migraine, asthma, scleroderma, malignant disease, and many of the endocrine disorders.

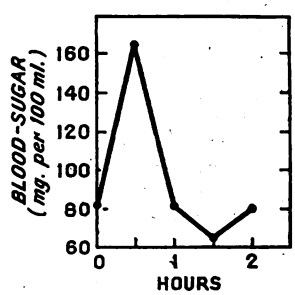

Fig. 1—Glucose-tolerance curve (glucose 50 g. given) showing lag type of response.

In practice 99% of cases in which hypoglycæmia is the main feature belong to two groups—organic hyperinsulinism and idiopathic spontaneous hypoglycæmia. In almost every other condition in which hypoglycæmia occurs the lowered blood-sugar is but a single incident among many, and often an accidental finding of little importance, quite overshadowed by the signs and symptoms of the main disease.

Little will be said here about organic hyperinsulinism, for the literature is already copious, though less than 200 proved cases have been described.

It has been claimed that hypoglycæmia is not rare (Harris 1933, Karlan and Cohn 1946), which contention is supported by an investigation described below, and it is the idiopathic form which is responsible for most cases. Little has been published on this latter type of hypoglycæmia, which has remained obscure in ætiology and mechanism and scarcely known to many. So great has been the confusion that many workers deny the existence of each other's described types.

The following subdivision of idiopathic spontaneous hypoglycæmia has been found convenient and appears comprehensive:

1. (*a*) Reactive hypoglycæmia;
   (*b*) Post-gastrectomy hypoglycæmia.
2. Nervous hypoglycæmia (dysinsulinism).

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Reactive Hypoglycæmia

Our concept of this disease is based on the type of glucose-tolerance response called by MacLean (1926) the "lag" curve and by Lawrence (1936) oxyhyperglycæmia (fig. 1). It was at first studied from the aspect of the initial hyperglycæmia, which requires differentiation from diabetes; but it is the following phase of falling blood-sugar level which is of present interest, since the level may drop sufficiently to cause symptoms of hypoglycæmia. A similar glucose-tolerance curve may be found in patients in whom hypoglycæmic symptoms develop, and it is believed that the blood-sugar follows the same "steeple" curve after ordinary meals, as is seen after the dose of glucose in the glucose-tolerance test, such depression of the blood-sugar being aggravated at times by high carbohydrate intake or by heavy work. The symptoms are often mild, and many cases pass unnoticed or undiagnosed; hence the scarcity of published descriptions. Prunty (1944) reported 1 case, and Luft (1947) gives brief details of 3.

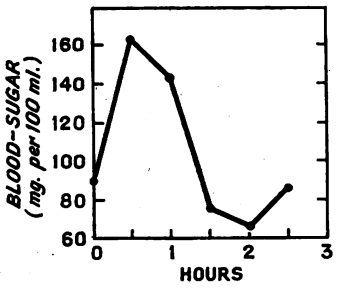

Fig. 2—Glucose-tolerance curve (glucose 50 g. given) showing hypoglycæmic response at 2 hours (without symptoms).

If symptoms of hypoglycæmia—e.g., weakness, hunger, tremulousness, faintness, sweating, and mild psychological upsets—occur at a time after meals when it can be imagined that the patient is at the low stage of the lag curve, the possibility of reactive hypoglycæmia should be remembered.

A man, aged 33, was brought to the casualty department having "fainted" while out walking, the attack consisting of a feeling of weakness and of being far away, with trembling and profuse sweating. His previous history was irrelevant, and there was no suggestion of any psychological abnormality. He complained of having felt off colour for the previous six months, during which he had had five similar attacks. He had lost consciousness for a few minutes on one occasion, when the attack had come on while he was doing manual work. All these attacks had occurred some two hours after meals and had lasted about an hour, after which he felt quite well again.

Physical examination revealed no sign of disease; his blood-pressure was 130/80, and his urine had no abnormal constituents. He was given glucose by mouth and felt well again shortly after. A glucose-tolerance curve was obtained later (fig. 2). The blood-sugar fell to 66 mg. per 100 ml. at one point, but no symptoms developed. An insulin-tolerance test showed no abnormality, though the patient noted the similarity of the symptoms to those occurring in his attacks. A blood-count and an electrocardiogram were normal. Treatment consisted in reducing his carbohydrate intake and giving extra protein and fat (special rations may be obtained for these cases), and he was recommended to carry a little sugar with him to take should he feel an attack coming. He has been free from symptoms for nearly eighteen months.

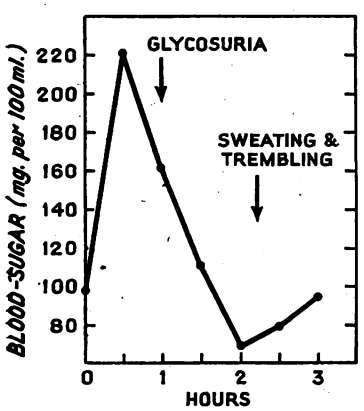

Fig. 3—Glucose-tolerance curve (glucose 50 g. given) in post-gastrectomy hypoglycæmia.

Post-gastrectomy and Post-gastro-enterostomy Hypoglycæmia

This type of hypoglycæmia, called the "dumping syndrome" by some, is seen in 5–25% of patients who have had surgical operations short-circuiting the normal route of gastric emptying. The condition was first described in Germany some years before the late war and has been reviewed by Evensen (1942). More recently it has attracted attention in America and in this country, and no further description of the syndrome appears necessary here.

The close relation of the syndrome to reactive hypoglycæmia does not seem to have been noted, however; yet they are similar in clinical features, course, and treatment, and the glucose-tolerance curve is of the same lag type in each (fig. 3). There is also evidence that both depend on a common cause (see below). Possibly this postoperative hypoglycæmia is an artificially produced reactive hypoglycæmia.

Patients who have undergone these surgical procedures sometimes complain of symptoms while eating or within a few minutes of meals. Whatever the mechanism of such symptoms they have nothing to do with hypoglycæmia; indeed Glaessner (1940) attributes them to hyperglycæmia. Failure to distinguish the two conditions, as in a paper by Gilbert and Dunlop (1947), leads to confusion and unjustified conclusions about mechanism and treatment.

Nervous Hypoglycæmia

Wilder (1940) is the main exponent of this form of hypoglycæmia, which has also been called dysinsulinism; he has made the diagnosis in 72 out of 108 cases seen at the Mayo Clinic. He emphasises the close relation to psychoneurosis in the personal and family history of these patients, and regards such neurosis as an important ætiological factor. Nervous hypoglycæmia has also been described by workers in one or two psychiatric clinics in the United States (Alexander and Portis 1944, Rennie and Howard 1942). Many articles have also appeared in America denying the existence of this type of hypoglycæmia, and it seems not to have been recognised in the British Isles. In this country, probably, most of these cases are classed as reactive hypoglycæmia, a condition little recognised in America, owing, perhaps, to the widespread use of venous blood for blood-sugar estimation there, for Lawrence (1936) has stressed the importance of using capillary blood for blood-sugar estimations if the diagnostic curve is to be obtained. The diagnosis may be considered where undoubted evidence of neurosis exists, but nervous hypoglycæmia appears to be a rarity and so is not discussed further here.

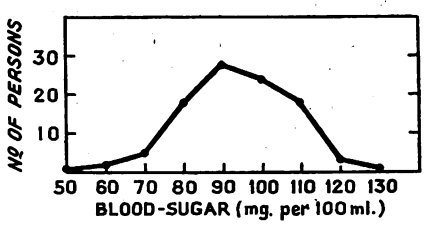

Fig. 4—Distribution curve showing noon blood-sugar values of 100 normal persons.

INCIDENCE

To find the incidence of idiopathic spontaneous hypoglycæmia 100 normal people were investigated for evidence of hypoglycæmia at a time after breakfast when it was calculated that the reactive fall in blood-sugar level might be operative. In 8 of them the blood-sugar was under 70 mg. per 100 ml., and 11 gave a history of what appeared to be typical attacks of mild hypoglycæmia, which they had experienced in the past. The results of the survey of noon blood-sugar readings are summarised as a distribution curve in fig. 4. Glucose-tolerance tests made on 2 of the persons who had a low noon blood-sugar and a positive history of attacks showed a typical reactive pattern of the lag type. The

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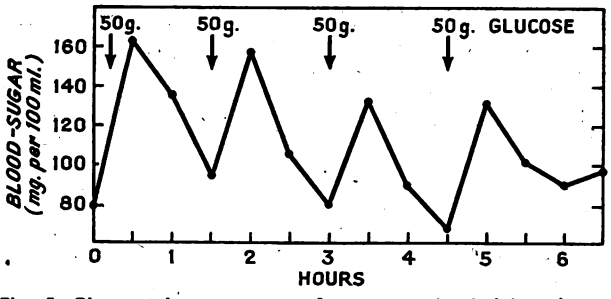

Fig. 5—Glucose-tolerance curve after repeated administration of glucose.

full details have already been given elsewhere (Hastings-James 1948).

These figures suggest that nearly 10% of the population may be considered as possible candidates for this type of hypoglycæmia. Though the symptoms are usually too mild to trouble the patient, sometimes medical advice is sought, and it then behoves the doctor to beware of dismissing such complaints as imaginary or neurotic.

MECHANISM AND PATHOGENESIS

Relation to Diet

The effects of variations in the diet on insulin-sensitivity are well known, and clinically a high-carbohydrate diet has been shown to predispose to hypoglycæmia, correction of this factor alone sufficing to cure the complaint in some cases. A meal containing abundant protein and fat causes a slow and sustained rise of blood-sugar and thus protects against individual attacks. Probably these factors are only contributory ; otherwise hypoglycæmia would be commoner, especially now that the average diet contains so much starch, and further, one sees many cases of hypoglycæmia in which no dietary abnormality is demonstrable.

Whether the spacing of meals has any effect on the development of symptoms is unknown, but a well-known phenomenon in connexion with the glucose-tolerance test, in which repeated administration of glucose causes a progressively smaller rise and greater fall in the swing of the blood-sugar, may perhaps be relevant ; it is sometimes called the Staub-Traugott effect. The type of response produced is shown in fig. 5, which shows the result of one of several tests on myself to see whether hypoglycæmia could be produced by different combinations of glucose, and represents the most successful result obtained, the blood-sugar falling to 65 mg. per 100 ml. at one point, though no symptoms developed. It does not seem possible to force the blood-sugar level down to any great extent by this method, since there appears to be some mechanism, working (it has been suggested) through the pituitary gland, which prevents such depression. However, even a small degree of hypoglycæmia may be important. For example, in industrial workers efficiency in the performance of skilled work might be impaired thereby, with greater predisposition to accidents, such depression in the blood-sugar resulting from a series of carbohydrate snacks and aggravated by the performance of manual work. An investigation of the blood-sugar level in industrial workers during the day's work might give interesting results.

No evidence of insulin-sensitivity was found in 4 cases of reactive hypoglycæmia which were tested. No evidence of increased insulin activity was seen, the blood-phosphate curve showing no abnormal fall during the falling phase of the blood-sugar.

Hyperglycæmia

The well-marked initial hyperglycæmia, which is a feature of these cases, must be taken into account, and an attractive and widely held theory is that it is the principal factor, causing a direct overstimulation of the islets of Langerhans, with a consequent excessive fall of the blood-sugar.

The initial hyperglycæmia is presumably due to rapid gastric emptying. Little is known about this factor in reactive hypoglycæmia, but in post-gastrectomy hypoglycæmia rapid emptying through the wide stoma is a feature of the complaint, cure of which, as by unpicking a gastro-enterostomy (Evensen 1942), leads to immediate restoration of the glucose-tolerance curve to normal. However, though such rapid emptying and hyperglycæmia be accepted, their ability to cause hypoglycæmia appears to be disproved by the following facts :

(1) We may compare the effects of giving glucose intra-intestinally, instead of by mouth, on the glucose-tolerance curve. Results published by Hale-White and Payne (1926), Kalk and Meyer (1932), and Wöhrle (1936) are conflicting. It is essential to use wide-bore tubes, allowing quick injection, and strong solutions, if the rapidity of the above-mentioned post-gastrectomy type is to be reproduced, and capillary blood should be used for blood-sugar estimations. In tests on 5 cases in which these factors were given consideration the hypoglycæmic phase was not significantly altered, though pronounced increase in the hyperglycæmia resulted.

(2) Hyperglycæmia per se does not lead to hypoglycæmia, as can be readily verified by examining the results of the numerous intravenous glucose-tolerance tests which are on record. Indeed, in 5 cases tested personally the hypoglycæmia was less with intravenous than with intrajejunal glucose, though the initial rise of the blood-sugar level was much greater with intravenous glucose. Even in patients subject to reactive hypoglycæmia intravenous glucose did not cause hypoglycæmia.

No explanation has been found for these apparent discrepancies. It will be noted that the route of administration of glucose must be a factor in the postoperative type, if not in the others. Two possible theories were investigated in an attempt to explain this : (1) that intestinal flooding and irritation produces the effect via a vagal reflex ; and (2) that the liver is responsible for these types of hypoglycæmia, perhaps reacting to portal hyperglycæmia.

The vagus.—It is known that the right branch of the vagus nerve gives a rich supply to the islets of Langerhans. The vagus is not essential to the production of insulin, as is shown by grafting experiments, but there is evidence that the nerve has a secretory action, though little work has been done on man. Experiments on 3 healthy volunteers showed that 'Moryl,' a parasympathetic stimulant, lowered and flattened the glucose-

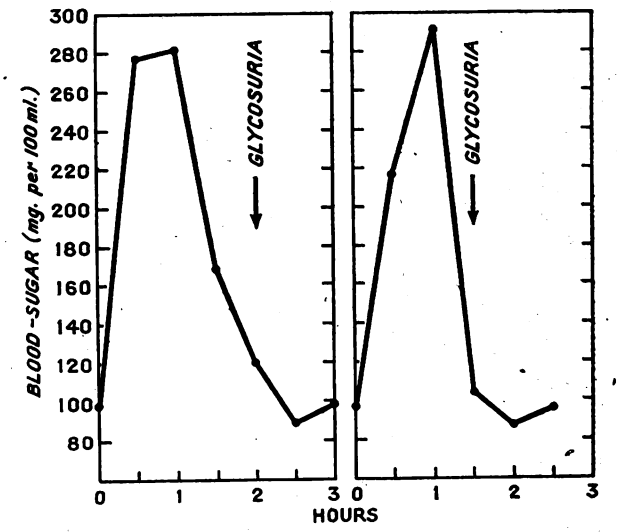

Fig. 6—Glucose-tolerance curve (glucose 50 g. given) in two cases after vagotomy.

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tolerance curve, whereas atropine had no effect, even in large doses.

The effects of vagotomy on the response to glucose were also investigated in 12 cases. One technical point to be noted is that time should be allowed for recovery to occur from the motility disturbances caused by the operation before attempting to carry out tests; otherwise flat curves are obtained. Such recovery is usually complete in two or three months. The operation led to a striking inability to meet the initial hyperglycæmia produced by the test dose of glucose (blood-sugars of 200 mg. or more, with massive glycosuria, being usual in the first two samples), especially if the regulating mechanism was placed under the additional strain of intestinal flooding from any short-circuiting procedure, such as gastro-enterostomy, when hyperglycæmia was as great as 250–300 mg. (fig. 6). Since such hyperglycæmia constitutes diabetes mellitus according to Joslin's standards, it may be queried whether these results do not contra-indicate this operation.

No deficiency was found in the fall which occurs in the second phase (fig. 6). Indeed it was precipitate in many cases, and in 4 cases it dropped below 70 mg. Further, I have seen cases in which typical post-gastrectomy hypoglycæmia has developed, despite vagotomy, judged to be successful by the response to the histamine-insulin test-meal. Also a case of post-gastro-enterostomy hypoglycæmia was not relieved by vagotomy.

I therefore concluded that the vagus plays no part in reactive or postoperative hypoglycæmia or in the production of insulin during the hypoglycæmic phase of the glucose-tolerance curve. Probably the vagus is a factor in the quick production of insulin in the initial stage, in response to the suddenly rising blood-sugar, and the possibility is not excluded that hypoglycæmia may be due to reflexes from the bowel, as postulated already, or from the gall-bladder (Conn et al. 1938) acting through the vagus, as it may also be due to the higher centres in nervous hypoglycæmia, Zunz (cited by La Barre 1930) having demonstrated such a central pathway in the dog.

The liver.—The concept that the liver is the seat of the hypoglycæmic effect is supported by much recent physiological work indicating its dominant rôle in the metabolism of carbohydrate and the shaping of the glucose-tolerance curve (Soskin and Levine 1946). Such an effect would presumably be functional, since no sign of liver disease is found; nor indeed is liver disease effective, save in gross degree, for some 80% of the liver must be destroyed before such metabolic upsets occur. This was confirmed in 20 cases of liver disease tested personally, the only abnormal result being obtained in a patient who died two days later with very extensive carcinoma of the liver, in whom the fasting blood-sugar level was 33 mg. per 100 ml. A possible mechanism for such a functional effect is a defective change-over from carbohydrate to fat metabolism, which change takes place normally two or three hours after a meal (Thorn, et al. 1943). Another possibility is that a portal hyperglycæmia, due to the intestinal flooding, might cause an excessive delayed inhibition of glycogenolysis in the liver, with consequent hypoglycæmia in the postabsorptive state. I hope to investigate this possibility further by venous catheterisation.

SUMMARY

The advantage of a simplified classification of spontaneous hypoglycæmia is emphasised. Nearly all cases fall into one of two groups—organic hyperinsulinism and idiopathic spontaneous hypoglycæmia. The former is rare; the latter is common and often unrecognised.

Some 10% of the population may be affected.

Causes of hypoglycæmia may include excessive carbohydrate intake, and injudicious spacing of meals.

Rapid gastric emptying and hyperglycæmia are not directly responsible, as can be shown by the results of intrajejunal and intravenous glucose-tolerance tests.

Vagal activity was not implicated in cases seen personally. The vagus plays no part in the shaping of the second part of the glucose-tolerance curve in man. Vagal action may, however, be important in meeting the initial hyperglycæmia; after vagotomy this may become so great that the patients are rendered diabetic by normal standards, especially if a short-circuiting operation is added.

The possible rôle of the liver is mentioned. Organic liver disease is excluded as a cause but two functional mechanisms are suggested as alternatives.

I wish to thank Prof. O. L. V. de Wesselow and Dr. F. T. G. Prunty for facilities and encouragement in the experimental work.

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DECAMETHONIUM IODIDE AS A MUSCLE RELAXANT IN ANÆSTHESIA

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BISTRIMETHYLAMMONIUM decane diiodide (decamethonium iodide; C10) is stated to have curarising properties in animals and man, with little effect on the muscles of respiration (Paton and Zaimis 1948a and b, Organe, Paton, and Zaimis 1949). An investigation has been carried out to ascertain the clinical application of this drug as a muscle relaxant in surgical anæsthesia. This preliminary report is based on a study of 85 cases.

CLINICAL METHODS

The subjects, whose ages ranged from 13 to 79 years, were unselected, and the surgical procedures varied from simple orthopædic manipulations to major thoracic surgery as follows:

Type of operation	*No. of cases*
Hysterectomy	17
Laparotomy	10
Bronchoscopy	9
Ear, nose, throat	7
Cholecystectomy	6
Herniorrhaphy	5
Œsophagoscopy	5

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Type of operation	No. of cases
Bladder operation	4
Partial gastrectomy	4
Plastic operations to face	3
Appendicectomy	2
Lumbar sympathectomy	2
Thoracotomy	2
Block dissection of neck	1
Laryngotomy	1
Lobectomy	1
Hemicolectomy	1
Hæmorrhoidectomy	1
Manipulation of knee	1
Pneumonectomy	1
Radical mastectomy	1
Salpingostomy	1
Total	85

All patients, after premedication with 'Omnopon' and scopolamine, or morphine and atropine, were induced with thiopentone. For maintenance of anæsthesia various combinations of the following agents were used: thiopentone, nitrous oxide, cyclopropane, ether, and trichlorethylene. The majority of the patients were anæsthetised with intermittent thiopentone-nitrous oxide-oxygen; whenever necessary respiration was assisted by rhythmic pulmonary inflation. The total dose of decamethonium iodide varied from 3 to 15 mg. which was always given intravenously. Two methods of dosage were employed; in the first the initial amount was from 3–5 mg. and subsequently 1–3 mg. was given as required. In the second the initial dose was calculated on the basis of 1 mg. per 15 kg. (33 lb.) body-weight, and subsequent doses were approximately one-half to one-third of this amount.

RESULTS

The onset of curarisation began after 2–3 minutes and reached a peak within 4–8 minutes. The duration of muscular relaxation was found to be fairly constant at 15–25 minutes. This relaxation as judged by the operators was satisfactory. It was observed, however, that relaxation comparable to that of *d*-tubocurarine could only be obtained with doses which paralysed the muscles of respiration, but very adequate operating conditions were present during the phase of respiratory recovery. In some cases this state of muscular relaxation with respiratory paralysis was obtained with the initial dose of 3 mg. Complete curarisation was produced by a dose little above the subthreshold one, and occurred suddenly. The return of muscular tone and respiration was equally abrupt, the tidal air returning to normal within 3 minutes of the onset of recovery. Repeated doses of the drug produced no cumulative effect even when given to maintain relaxation for as long as 3 hours. Decamethonium iodide appeared to be equally effective with all the anæsthetic combinations employed, including ether, although this has been stated to have an inhibitory effect on muscular relaxation in animals (Paton and Zaimis 1948c).

Side-effects

No significant side-effects were noted, except a transient rise of respiratory rate on recovery from respiratory paralysis. There was no significant change in the cardiovascular system, as evidenced by recordings of blood-pressure, pulse-rate, and the electrocardiogram. No circulatory changes in the skin were observed, neither was there any evidence of increased bleeding. Prothrombin-times determined before, during, and after operation showed no significant change.

Bronchial or laryngeal spasm was not observed in any case after the administration of decamethonium iodide. In 21 cases a dose of 2–3 mg. was used with thiopentone to facilitate oral intubation. In 4 cases a previously existing bronchial spasm was temporarily abolished by the drug. In 12 cases an intradermal injection of 0·1 ml. of an 0·1% solution of decamethonium iodide did not produce the characteristic histamine weal and flare, which appeared in every one of 100 cases similarly tested with a solution of *d*-tubocurarine of the same, or weaker, dilution.

Pentamethonium Iodide as an Antagonist to Decamethonium Iodide

Bistrimethylammonium pentane diiodide (pentamethonium iodide; C5) is claimed by Paton and Zaimis (1948b) to be an antidote to decamethonium iodide. They also draw attention to its autonomic blocking effect, which would appear to be a definite contra-indication to its use in major surgery, with the attendant liability to shock. However, to evaluate the clinical effect in restoring respiration to normal, it was deliberately used in 8 cases, in a dose of 30–50 mg. In 6 of these the results were not spectacular, and the time taken for respiration to return to normal was not markedly lowered.

In 3 cases the autonomic blocking effect of pentamethonium iodide produced an alarming degree of circulatory collapse. These were cases in which the surgical manœuvres (two laparotomies and one thoracotomy) were in themselves shock-producing.

POSTOPERATIVE COMPLICATIONS

Restlessness was observed in 4 cases, in 3 of which it was severe enough to necessitate restraint. Two cases of urinary retention were noted, but this condition disappeared within twenty-four hours. There were no cases of thrombosis or ileus, and no increase in the pulmonary complication rate.

DISCUSSION

Decamethonium iodide produces adequate muscular relaxation for major surgery, but only in doses which produce respiratory paralysis. This is at variance with the suggestion of Organe, Paton, and Zaimis (1949) that clinically the drug should prove to be a useful curarising agent whilst sparing the muscles of respiration. The fact that respiratory paralysis is a constant accompaniment of good muscular relaxation may appear to be a disadvantage, but as the action of decamethonium iodide is transient (15–25 minutes) there is no real danger of postoperative respiratory depression. Again, because of its lack of cumulative effects, it has a wide margin of safety, when used in the amounts suggested. In none of the 85 cases was there sufficient respiratory depression at the end of the operation to cause alarm. In fact, the duration of muscular relaxation from any one dose was surprisingly constant. Because of this transient action and lack of cumulative effect, decamethonium iodide may prove most useful for some operative procedures. The absence of immediate side-effects with it is noteworthy, particularly those affecting the bronchial tree.

Although no actual observations were recorded on this point, the clinical impression was gained that the drug had a slight vagal inhibitory effect. During upper abdominal surgery, the tendency to respiratory "grunting" seemed to be less than with *d*-tubocurarine. Again in pulmonary surgery, traction on the bronchus did not provoke spasm. This clinical impression of vagal inhibition is borne out by the failure to observe bronchial spasm in any of the 85 cases. In fact, in 4 cases, pre-existing bronchial spasm was temporarily alleviated.

A possible cause of the mechanism producing the postoperative restlessness occurring in 4 cases, was afforded by the experience of a volunteer who received 2 mg. while conscious. He complained of cramping pain and tenderness in his limbs, lasting several hours, which increased on exercise. It must also be pointed out, as another possible explanation, however, that these 4 cases of restlessness occurred at a very early stage in this study, and may have been due to inadvertent underdosage.

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The effects observed with the antagonist were not unexpected in view of its pharmacology, the side-effects severely limiting its use.

SUMMARY

The effect of decamethonium iodide has been investigated as a muscle relaxant in surgical anæsthesia. It is a satisfactory relaxing agent with a wide margin of safety, provided adequate pulmonary ventilation is maintained. Its effect is transient, but this is unimportant since repeated doses have no cumulative effect. There are no significant side-effects.

The antagonist pentamethonium iodide has no useful place in anæsthetic practice because of its autonomic blocking effect, which might be a contributory factor in operative shock.

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COMPARISON OF DECAMETHONIUM IODIDE WITH *d*-TUBOCURARINE IN CONTROLLING ELECTRICALLY INDUCED CONVULSIONS

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IN a previous publication (Hobson and Prescott 1947) it has been shown that curarisation of the patient avoids the traumatic complications of electroconvulsion therapy (E.C.T.), and enables this form of treatment to be administered to patients in whom unmodified convulsion therapy would be contra-indicated because of physical abnormalities. The treatment has not been very widely accepted, and has been criticised as unnecessary and dangerous (McGuiness 1947, Sandison 1947, Wilcox 1948). We have continued, however, as a routine, to modify E.C.T. with *d*-tubocurarine and thiopentone, and have given over 1500 treatments, with no residual complications of any kind. Of the 200 treated, 5 developed bronchospasm whilst under treatment, but this was relieved by giving a second injection of thiopentone and adequate insufflation with oxygen, without any sequelæ.

Bronchospasm is, however, an alarming condition to combat, and is potentially dangerous. It is felt that the histamine-producing property of curare preparations, with the attendant risk of bronchospasm, is the chief drawback to their use. The description of the relative sparing of respiration and the absence of side-effects in the curarisation produced by bistrimethylammonium decane diiodide (now known as decamethonium iodide and commonly as C10) (Organe, Paton, and Zaimis 1949) led us to investigate the drug as a possible substitute for *d*-tubocurarine chloride in modifying electrically induced convulsions.

As each patient received a course of several convulsions the curarising properties of decamethonium iodide and *d*-tubocurarine were effectively compared by using them in alternate treatments in the same patient, who thus became his own control.

CLINICAL MATERIAL

Decamethonium iodide and thiopentone were administered to 40 patients undergoing E.C.T. for psychiatric illness; approximately half were inpatients and half outpatients. In all, 200 treatments were given. Of the 40 patients treated, 20 were on other occasions given E.C.T. controlled by *d*-tubocurarine, in order to compare the effects of the two drugs. An attempt was made to collect as many patients as possible in whom unmodified E.C.T. would have been dangerous if not absolutely contra-indicated. One agitated depressed patient had previously had a coronary thrombosis, and three months before his treatment was suffering from all the signs of severe left-ventricular failure with a blood-urea of 200 mg. per 100 ml. After six treatments this patient's depressive symptoms disappeared and there was no evidence of any adverse effect upon his cardiac condition. Also included in the series were hypertensive, arteriosclerotic, diabetic and senile patients, and two patients with hernia.

DOSAGE AND TECHNIQUE

It was found by preliminary investigation that 1 mg. of decamethonium iodide produced the same degree of curarisation as 4 mg. of *d*-tubocurarine chloride. The dose of *d*-tubocurarine chloride required to give adequate relaxation is approximately 2 mg. per stone (0·3 mg. per kg.) of body-weight (Hobson and Prescott 1947). The dose of decamethonium iodide given therefore was approximately 0·5 mg. per stone (0·08 mg. per kg.) of body-weight.

Unlike the commercial preparations of *d*-tubocurarine chloride, decamethonium iodide does not produce a precipitate when mixed with thiopentone. It was unnecessary therefore to give the decamethonium iodide in a separate syringe from the thiopentone and atropine which are administered in the treatment. With this difference the technique of administration was similar to that previously described (Hobson and Prescott 1947, Hobson 1947).

The treatment was usually given in the morning with the patient fasting. Blood-pressure and pulse-rate were taken before treatment. Decamethonium iodide, thiopentone, and atropine sulphate were given intravenously from the same syringe. No disadvantage was found in giving the injection rapidly. The usual dosage of the drugs was decamethonium iodide 0·5 mg. per stone of body-weight; thiopentone 0·3 g. in 5% solution; atropine sulphate gr. $^1/_{75}$–$^1/_{50}$.

After the injection an interval of three minutes was allowed to elapse to enable curarisation to reach its maximum, before administering the convulsion. During this interval, the patient's pulse-rate and blood-pressure were taken, the E.C.T. electrodes were applied to the patient's head, and oxygen was administered by means of an insufflator. A mouth-gag was inserted to prevent biting of the lips during the initial jerk of the patient immediately after the administration of the shock. No methods of mechanical restraint nor attempts to hyperextend the spine were used.

Bistrimethylammonium pentane diiodide (pentamethonium iodide, C5) the antagonist of decamethonium iodide (Organe, Paton, and Zaimis 1949) was always kept in readiness but never used as severe respiratory depression was never encountered. The patients were insufflated with oxygen after the convulsion if there was the slightest sign of cyanosis or respiratory depression. Occasionally, when there was respiratory obstruction, an airway was inserted.

The treatment was usually given to patients twice weekly. Outpatients were allowed to rest for two hours after the treatment before going home.

OBSERVATIONS

The patient became unconscious within a few seconds of giving the thiopentone. Within three minutes the patient was relaxed, respiration slightly depressed, and breathing mainly abdominal. Immediately after adminis-

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tering the shock the patient gave a slight jerk corresponding to the tonic convulsion, and after a latent period of a few seconds there was a very modified tonic convulsion. There was no gross movement of the limbs, and the cry and opisthotonos of the unmodified convulsion were absent. There was no detectable difference between the softening of the convulsion due to decamethonium iodide, or due to *d*-tubocurarine. There was no evidence that decamethonium iodide produced muscular paralysis while sparing respiration (Organe, Paton, and Zaimis 1949).

Sweating and cyanosis were not usually seen and there were no histamine-like reactions. Unlike *d*-tubocurarine, decamethonium iodide injected intradermally produced no weal and flare. Bronchospasm was not seen following the injection of decamethonium iodide in any of the patients. One, a hypertensive male of 18 stone with a history of asthma, had bronchospasm after E.C.T. modified by *d*-tubocurarine but negligible respiratory disturbance in five subsequent treatments in which decamethonium iodide was used instead of *d*-tubocurarine.

There was a slight rise in blood-pressure during and after the convulsion modified by decamethonium iodide, but where curarisation was adequate this rise was insignificant and comparable to that seen after administering *d*-tubocurarine.

It was observed that the effects of curarisation passed off more rapidly and earlier after giving decamethonium iodide than after the administration of an equivalent dose of *d*-tubocurarine. Several patients were able to sit up ten to fifteen minutes after the convulsion modified with decamethonium iodide; the time after giving *d*-tubocurarine is rarely less than half an hour.

No complications followed any of the treatments of the present series. No fractures or dislocations occurred and there were no complaints of muscle stiffness. The only unpleasant symptoms between treatments were headache and impairment of memory and concentration, which evidently resulted from the electrical convulsion rather than from the administration of decamethonium iodide.

Though the series is too small to draw a statistically significant conclusion, decamethonium iodide appears not to influence the therapeutic effect of E.C.T. Enough cases have now been treated with *d*-tubocurarine and 'Intocostrin' to demonstrate that curarisation does not affect the efficacy of induced convulsions.

DISCUSSION

The major drawbacks of E.C.T.—namely, fractures, dislocations, and cardiovascular accidents—are eliminated as effectively with decamethonium iodide as with *d*-tubocurarine. Mechanical precautions are rendered unnecessary. Preliminary curarisation enables E.C.T. to be given to patients to whom unmodified E.C.T. would be dangerous.

No patient should be given a curarising drug unless efficient facilities for controlled respiration are at hand and the administrator is competent to deal with the apnœic patient. The injection of stimulants or analeptics cannot replace the provision of a clear airway and rhythmic insufflation of oxygen. It seems probable that fatalities which have occurred in using curarising drugs to soften electrically induced convulsions have been due to the inefficient methods of artificial respiration used.

SUMMARY

The use of decamethonium iodide and thiopentone for modifying electrical convulsions is described. Decamethonium iodide has all the advantages of other curarising drugs: the traumatic complications of convulsion therapy are avoided; there is no serious rise in blood-pressure; and it enables convulsion therapy to be given to certain patients in whom otherwise convulsions would be contra-indicated. Decamethonium iodide is to be preferred to *d*-tubocurarine for this purpose, as it has no tendency to produce histamine-like reactions, and as the curarisation passes off more rapidly. Minor advantages are that it is miscible with thiopentone without precipitation, and, as it is a synthetic preparation, it should not need biological standardisation.

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CARCINOMA OF THE PARATHYROID GLAND WITH HYPERPARATHYROIDISM

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UNEQUIVOCAL malignant disease of the parathyroid gland with hyperfunction is rare, though many clinically benign cases have been claimed as malignant solely on the microscopical appearances of the tumour (Alexander et al. 1944).

Three cases of hyperfunction of the parathyroid showing undoubted evidence of clinical as well as histological malignancy are recorded (Meyer et al. 1939, Meyer and Ragins 1943, Gentile et al. 1941, Black 1948). After the removal of the primary parathyroid tumour there was a recovery in each case for periods up to $1^1/_2$ years before a return of hyperparathyroidism. In each the relapse was associated with recurrent tumour formation at the original site.

In Gentile's case a second operation was followed by a slow recovery. Histologically the tumour showed intravascular invasion with tumour cells and secondary deposits in a local lymph-gland.

In Black's case the original tumour had only been partially removed at the first operation, for fear of tetany. At the second operation a recurrent tumour mass was found invading muscle, and local lymph-glands were enlarged. Operation was followed by recovery. The histological appearances showed invasion of muscle by tumour cells and secondary deposits in lymph-glands.

In Meyer's case the recurrent tumour was considered to be inoperable. Deep X-ray therapy was tried without effect, and the patient died nearly four years after the original onset of symptoms. Necropsy showed local recurrence, regional metastases, and metastases in the lungs and right kidney.

The following case shows incontrovertible evidence of malignancy associated with excessive secretion.

CASE-RECORD

FIRST ADMISSION, DEC. 12, 1942: ST. THOMAS'S HOSPITAL

A woman, aged 35, was admitted with a year's history of backache and pain in the right hip, and four years' history of increasing thirst, polyuria, and stiffness of both legs. Gradually the stiffness had changed to pain, brought on more especially by exercise. A year before admission she became increasingly weak; she had a "tendency to fall more than other people," and her movements were extremely slow. At the same time her mother noticed that the patient's back was becoming bowed. For a few months before admission pain in the right hip and back was severe, and three weeks before she was admitted she fell in the street, injuring her right knee.

On examination her general condition was good. A firm tumour, about 2 cm. in diameter, in the region of the lower pole of the left lobe of the thyroid gland and some hard lumps beneath the upper third of the left sternomastoid muscle

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were found. A moderate upper dorsal kyphosis was present, and any attempted passive or active movement of the legs was limited by severe pain. There was no deformity of the limbs. The blood-pressure was 140/90 mm. Hg. The urine contained no albumin or sugar. X rays showed decalcification of the whole skeleton, with areas of cystic change, characteristic of the bone changes associated with hyperparathyroidism. There were also some calcified glands in the upper third of the left side of the neck. Blood findings: serum calcium 16 mg. per 100 ml., phosphorus 2·5 mg., alkaline phosphatase 42 units, and urea 32 mg.

On Jan. 9, 1943, a cystic tumour, about 1 cm. in diameter, was removed. It arose from the under surface of the left lower lobe of the thyroid gland. During the operation the tumour was accidentally ruptured into the wound.

Histologically the main body of the tumour was composed of principal cells arranged in fasciculi with a tendency to cyst formation but showing no evidence of acinar arrangement. Occasional small areas of oxyphil cells were present. Trabeculæ were prominent throughout the tumour, and in some areas the cells showed the characteristics of water-clear cells, being large with a very distinct cell membrane and a water-clear cytoplasm. Scattered in the trabeculæ were collections of eosinophil cells. Among the principal cells there were a very few scattered giant-cells of the same type as the principal cells but with darker-staining nuclei. The tumour was encapsulated, but in places its cells seemed to invade the capsule, which had areas of old hæmorrhage, shown by the presence of altered blood pigment.

Pains in the legs and excessive thirst ceased within two days of operation. Two days later blood analysis showed serum calcium 8·5 mg. per 100 ml., phosphorus 3·3 mg., and alkaline phosphatase 37·8 units. A week after operation, while the patient was on a normal diet containing 0·75 g. of calcium per day, a 24-hour specimen of urine contained calcium 0·01 g. (normal 0·01–0·30 g.) and phosphorus 0·495 g., equivalent to 2·26 g. of phosphate per day (normal 1–5 g.). The patient was discharged three weeks after operation, with serum calcium 8·9 mg. per 100 ml., phosphorus 2·7 mg., and alkaline phosphatase 41 units.

While recovering, she had œdema of the ankles and difficulty in relearning to walk, but within two months she could walk normally and felt perfectly well.

SECOND ADMISSION, NOV. 27, 1944: BIRMINGHAM UNITED HOSPITAL

Six weeks before readmission there was a sudden onset of thirst, polyuria, pains and stiffness in the limbs, continuous nausea, and repeated vomiting. These symptoms all became more severe and were associated with much loss of weight.

Several hard irregular mobile nodules were found in the line of the scar, just above the thyroid cartilage on the right side. Examination of the blood showed blood-pressure 135/110 mm. Hg, Hb 52%, and red cells 2,500,000 per c.mm. Radiography showed absorption areas in the bones of the pelvis and one in the neck of the right femur; the right kidney area showed a shadow suggesting a stone, the sella turcica was normal, and the cardiac outline was within normal limits. The basal metabolic rate was +19%, and electrocardiography showed depressed R-T segments in leads 2 and 3. The serum calcium was 20·3 mg. per 100 ml., phosphorus 2·9 mg., and alkaline phosphatase 17·1 units.

On Dec. 17, 1944, several fairly large and firm nodules infiltrating the pretracheal muscles beneath the skin were removed. The right lobe of the thyroid gland was normal, but the lower end of the left lobe was hard and fixed to the jugular vein. As much as possible was removed and the rest pierced with a diathermy needle.

Histologically the sections showed the typical structure of parathyroid gland with no obvious pathological change.

The day after operation vomiting ceased, and twelve days later the serum-calcium level was 14·3 mg. per 100 ml. Hoarseness of voice, which developed immediately after operation, was followed by a slow but only partial recovery. The patient was discharged, and though there was some improvement it was never so complete as after the first operation. Weakness remained prominent.

THIRD ADMISSION, MAY 22, 1945: BIRMINGHAM UNITED HOSPITAL

Two weeks before readmission there was a sudden severe pain in the right chest, and deformity of the back seemed to increase.

On the right side of the neck another subcutaneous nodule was felt. The serum-calcium level was 18 mg. per 100 ml. The nodule was removed and found to be parathyroid adenoma of clear principal cells. This operation was followed by a course of deep X-ray therapy to the neck, and on July 27, 1945 (two months after admission), the serum calcium was 16 mg. The symptoms gradually decreased until the patient could lead a more or less normal life, except for some occasional severe pain in the chest and back.

FOURTH ADMISSION, JUNE 6, 1946: ST. THOMAS'S HOSPITAL

For three months before readmission there was a recurrence of thirst and polyuria, followed by weakness, stiffness, and pains in the limbs.

Two small lumps were found under the skin, attached to the inner border of the lower 2 in. of the left sternomastoid. The kyphosis was more pronounced. Blood-pressure was 140/95 mm. Hg, and the urine contained albumin. Radiography of the bones showed widespread generalised cystic disease. The serum calcium was 16·2 mg. per 100 ml., phosphorus 2·3 mg., and alkaline phosphatase 70 units. A urea clearance was 80% of average normal.

A second course of deep X-ray therapy was given; and, when the patient was discharged six weeks after admission, on July 27, 1946, her blood contained calcium 13·8 mg. per 100 ml., phosphorus 1·9 mg., and alkaline phosphatase 57 units. Again recovery was slow, but the improvement continued for the next year, though the constituents of the blood gradually became more abnormal. On Oct. 16, 1946, the serum calcium was 15·6 mg. per 100 ml., phosphorus 2·8 mg., and alkaline phosphatase 65 units, and on March 26, 1947, calcium was 16·4 mg., and phosphorus 1·8 mg. No further estimations were done, and the patient led a more or less normal life, except for the use of a stick because of residual pain in the right hip.

Fig. 1.—Tumour tissue removed on July 17, 1946. (× 140.)

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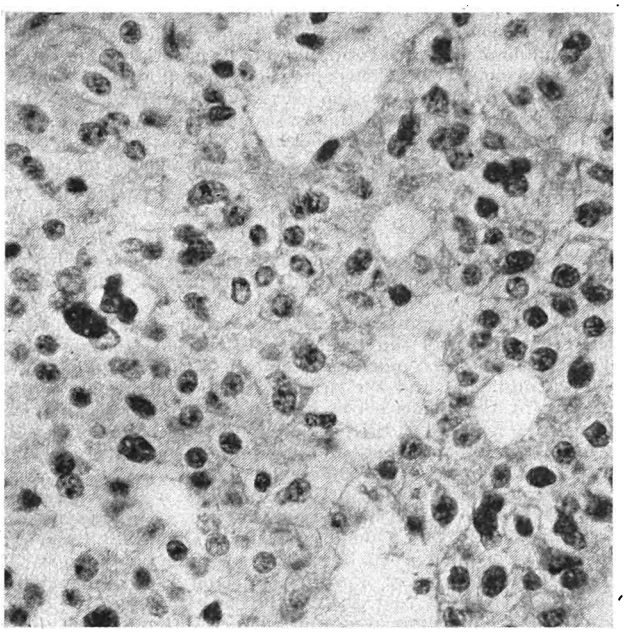

Fig. 2—Tumour tissue removed on July 17, 1948. (× 520.)

FIFTH ADMISSION, JUNE 26, 1948: ST. THOMAS'S HOSPITAL

Six months before readmission the patient noticed a small lump on the inner end of the right clavicle. Three months before readmission she developed vomiting, fatigue, thirst, polyuria, and stiffness of the legs. For a few weeks she had slight swelling of the ankles.

The patient's excessive thirst was obvious throughout the examination, but otherwise she seemed comfortable, though apprehensive. There was a mobile firm subcutaneous lump 1 cm. in diameter, lying over the sternal head of the right clavicle. The two nodules found two years before in relation to the left sternomastoid were still present. In the midline there seemed to be a fourth tumour lying in front of the trachea, projecting about $^1/_2$ in. from beneath the sternum.

There was no cyanosis, and the hands were warm. The jugular venous pressure was raised about 1 in. above the sternal angle, and abdominal pressure produced a sustained rise for another 2 in. There was minimal œdema over the sacrum and ankles, and the liver was palpable but not tender. A forcible apex-beat was palpable in the 4th interspace in the midclavicular line, and a loud gallop rhythm, due to a 4th heart sound, could be heard and felt all over the heart. There was no deformity of the limbs, but the kyphoscoliosis was now more severe, together with gross deformity of the chest.

Blood-pressure was 123/98 mm. Hg. The specific gravity of the urine was 1·002–1·005, and albumin was present. After eleven hours' deprivation of fluid the specific gravity of the urine was 1·005. The daily volume of urine varied between 2 and 4 litres. Examination of the blood showed Hb 78%, red cells 3,710,000 per c.mm., and white cells 7600 per c.mm. Electrocardiography showed slight left ventricular preponderance, sagging of the R-T interval in leads 1 and 2, and Q-T interval 0·28 sec. (normal at this rate in women 0·29 sec.). Radiography of the bones showed no change from the previous appearances; a small area of calcification was evident in the right renal area, but an intravenous pyelogram revealed no abnormality; a radiogram of the chest showed no obvious cardiac enlargement.

Serum calcium was 23·0 mg. per 100 ml., phosphorus 3·3 mg., and alkaline phosphatase 28·2 units. The urea clearance was 54% of average normal, with a blood-urea level of 56 mg. per 100 ml.; the fasting blood-sugar level was 84 mg. per 100 ml.

Four days after readmission the nodule overlying the right clavicle was removed and found to be a parathyroid adenoma with infiltration of the capsule. There was little relief of thirst or polyuria, and early morning vomiting continued. Blood analysis two weeks after this operation, on July 6, showed calcium 18·1 mg. per 100 ml., phosphorus 3·5 mg., alkaline phosphatase 56 units, potassium 18·5 mg., chlorides 681 mg., carbon dioxide 48 vols.%, total protein 6·56 g. per 100 ml., and blood-urea 59 mg. A week later the findings were very similar, with calcium 17·9 mg., phosphorus 3·7 mg., and potassium 15·8 mg.

It was now decided to explore the neck thoroughly, and another operation was performed on July 17. The superficial nodules over the left sternomastoid were widely excised. All the tissues were found to be extremely fibrous and matted. A large mass of "fibrotumorous" tissue was found adherent to the left side of the larynx and œsophagus, extending from the level of the cricoid cartilage to the aortic arch, with displacement of the trachea to the right. This mass was removed incompletely, since some firmly adherent remnants were left in the region of the aortic arch, the posterior surface of the sternum, and the left side of the œsophagus. Some necrotic contents were discharged into the wound during the operation.

Histologically sections of the tumour showed similar appearances to those described previously. The cells were of the eosinophil or clear-cell type, and invasion of the surrounding connective tissue was well marked. The neoplasm had given rise to a considerable fibrous reaction, and in the fibrous tissue, brown pigment, the result of old hæmorrhage, was present. There was also evidence of calcification. The appearances suggested a tumour of low malignancy.

Early morning vomiting ceased within 24 hours of operation, and 12 hours later the serum contained calcium 10·8 mg. per 100 ml, phosphorus 3·8 mg., and alkaline phosphatase 4·4 units. The daily volume of urine diminished to 2 litres, and the blood-urea fell to 44 mg., but a urea clearance two weeks after operation remained at 47·2% of average normal. Huskiness of voice, which had been present to a slight extent on readmission, became more severe after operation, and laryngoscopy showed a total palsy of the left vocal cord.

On discharge the patient had put on 6 lb. in weight and showed no sign of cardiac failure. There remained, however, a soft quadruple rhythm at the apex. Two weeks after operation serum calcium was 11·1 mg. per 100 ml., phosphorus 2·9 mg., and alkaline phosphatase 79·1 units. The biochemical and clinical progress are shown in fig. 3.

DISCUSSION

This case presents both clinical and histological evidence of malignancy associated with hyperfunction. Clinically, it is inexplicable that all the local recurrences arose either as hypertrophy of aberrant parathyroid tissue or as widespread seedlings distributed as the result of the accidental rupture of the first tumour. Some of the secondaries, especially that over the right clavicle, were placed too far from the original wound to be seedlings and in regions where aberrant parathyroid tissue is most unlikely to be found.

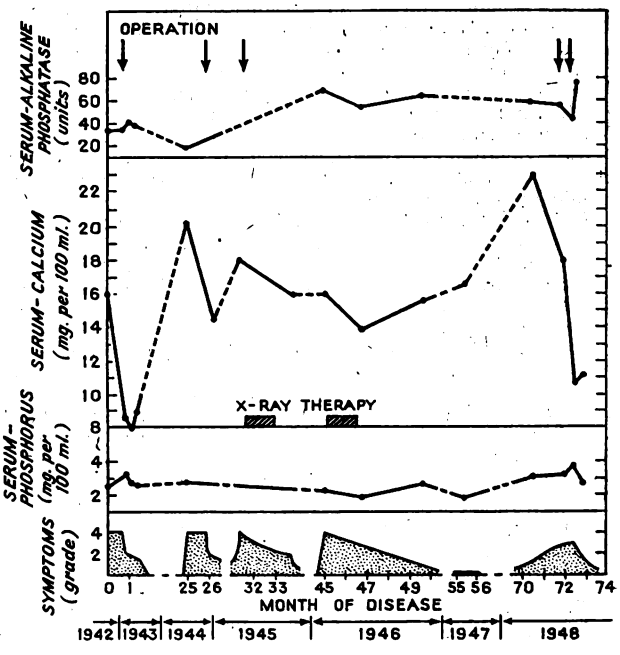

Fig. 3—Biochemical and clinical progress.

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It therefore seems that this tumour of the parathyroid gland, which might originally have been classified as benign, gave rise to multiple local cell spread, and that the cells, having reached their new destination by whatever means, multiplied and produced hormone in excess of the body's demand. The case therefore provides further evidence that malignancy of the parathyroid gland is compatible with production of parathyroid hormone.

Other points of interest are the response to deep X rays, the apparent acquired tolerance of the patient to a high blood-calcium level, the sudden onset of symptoms in some of the relapses, and the appearance of cardiac failure.

Deep X rays were used twice. On each occasion there was some biochemical improvement, though never a complete cure. Symptomatically each course was followed by a gradual return to normal. This very moderate response is not surprising in view of the differentiated nature of the tumour. In this connexion it is interesting to note the complete lack of response of Meyer's case to deep X-ray therapy, though in his case this complete resistance was possibly due to the continued excessive production of hormone from the lung and kidney metastases, which were not subjected to deep radiation.

When our patient first presented in 1942, the serum-calcium level was 16 mg. per 100 ml., returning to normal after operation. It is impossible to state what happened in the next two years. In 1944, however, there was a return of symptoms, with a level of 20·3 mg. From the end of 1944 to the middle of 1947 the serum level, whenever estimated, was always above normal. Throughout this time there were several remissions of symptoms, though the serum calcium was never below 13·8 mg. per 100 ml., and appears to have averaged about 16 mg. For a year before the last readmission it was steadily rising, while the patient's symptoms were subsiding. At a level of 16·4 mg., three months before her last readmission to hospital, the patient said she felt well and could lead a normal life. This level was the same as that which, five years before, had been associated with gross weakness, stiffness, pains in the limbs, thirst, and polyuria.

The sudden onset of severe symptoms in most of the relapses is similar to the acute hyperparathyroid crises described in the literature. A good review of this manifestation is given by Rogers (1946). A feature of these crises is cardiac failure, as in the present case. We wondered whether the cardiac failure might not be due to the generalised bone changes, as in Paget's disease. It has been suggested that cardiac failure in Paget's disease is due to an arteriovenous shunt through the over-vascular bone-marrow (Edholm et al. 1945). Results of bone blood-flows in the present case, however, were equivocal, and it was considered more likely that the cardiac failure was due to the very high blood-calcium. The clinical relationship of a high blood-calcium to the heart's action is not clear, but definite reversible non-specific electrocardiographic changes have been produced experimentally in dogs (Gold and Edwards 1925) and shown in cases of hyperparathyroidism before and after operation (Kellog and Kerr 1936). Our case showed some electrocardiographic changes before operation, but unfortunately no further electrocardiography was done after operation.

For information on the past history of this case we have to thank Mr. R. H. O. B. Robinson, who first operated on her, and the authorities of the Birmingham United Hospital. Our thanks are also due to Mr. J. M. Pullan, who performed the latest operation, Dr. J. Bamforth for pathological, and Dr. F. T. G. Prunty for chemical, observations, and Mrs. Brown and Dr. G. Wetherley-Mein for the chart and photographs.

References at foot of next column

ABDOMINAL INJURY FROM LIGHTNING

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FEW reports of visceral lesions from lightning have been published. Hence the following case of gangrene of the cæcum seems worthy of record.

CASE-REPORT

During a thunderstorm, at about 3.30 P.M. on June 28, 1948, a labourer, aged 20, was struck by lightning. He could remember nothing of the incident, and the following details were supplied by witnesses.

Our patient was sheltering in a small empty wooden hut with two companions. One of these saw a "yellow ball of fire" come in through the door, strike him (the witness) on the side of the face, and then the patient on the top of the back, and pass out through the window. All the witness felt was a "light tap on the face," but he became deaf for about a week. He noticed no disturbance of the air. The only damage to the hut was that one or two panes of glass in the window were smashed. The other companion, who could not be traced for interview, was reported to be uninjured.

The patient was seen to fall forwards, but there was nothing unduly violent about his fall. A St. John Ambulance attendant, who was in a neighbouring hut, was on the scene in a few seconds and found the patient unconscious, "curled in a ball as though dead." His shirt had been burnt beneath his cigarette-case. He was the only one of the three men in the hut who was wearing gum-boots. Artificial respiration (Schäfer's method) was applied for 10–15 min., and the patient was brought by ambulance to hospital, where he was admitted at 4.20 P.M.

On admission he was still unconscious and shocked. He vomited copiously soon afterwards. He regained consciousness at 5.30 P.M., after which he became noisy and restless. Morphine gr. $^1/_6$ was given at 4.35 P.M. and gr. $^1/_4$ two hours later. During the night he complained of abdominal pain, and the vomiting continued. Next day he was seen by Dr. G. R. Royston, who referred him to us because of the abdominal signs.

On examination (June 29, 5 P.M.) the patient was still complaining of lower abdominal pain and vomiting bile. His general condition was fairly good: pulse-rate 120, blood-pressure 110/75. There was some generalised tenderness and guarding of the abdomen. On auscultation, very faint peristaltic sounds were heard. There was no definite tenderness on rectal examination. There were extensive arborescent burns on the neck and left side, chest, abdomen, and thigh. Signs of chronic bronchitis and old infantile paralysis of the left arm and leg were found. (The patient informed us afterwards that he had been told as a child by his doctor that a lightning stroke alone could cure his paralysis—a prophecy unfortunately not fulfilled.)

Treatment.—An intravenous infusion of plasma 1 pint, followed by saline solution, was started, and continuous gastric suction instituted. At 9.30 P.M. his general condition was better; pulse-rate 100. The guarding was now localised to the right iliac fossa. On auscultation, however, peristalsis was completely absent. Laparotomy was decided on and done at 11 P.M. ($31^1/_2$ hours after injury). Pre-

PROF. DE WESSELOW, DR. DE WARDENER: REFERENCES

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medication ('Omnopon' gr. 1/3, scopolamine gr. 1/150) was given at 10 P.M.

Operation.—General anæsthesia (thiopentone-cyclopropane-'Tubarine') was administered by Dr. C. R. Jenkins. The abdomen was opened through a right paramedian incision centred on the umbilicus. There was turbid free fluid in the peritoneal cavity. A well-demarcated patch of gangrene, 3 × 2 in., was at once evident on the cæcum on its lateral aspect between the tæniæ; it had a blown-out appearance and seemed to be about to burst. The cæcum otherwise was distended and hyperæmic. The appendix was normal. There was a paralytic ileus of the small intestine, some loops of which, in contact with the cæcum, were covered with lymphy exudate. A rapid examination of the rest of the small bowel showed nothing abnormal. No hæmorrhages were seen. The ascending colon was mobilised and a hemicolectomy done, with end-to-side anastomosis of ileum to transverse colon. The abdomen was closed without drainage.

Progress.—The patient made a good recovery. Peristaltic sounds were audible on the second day, and the bowels acted on the fourth. He got up on the eleventh and was discharged on the eighteenth day. He resumed his former work on Aug. 30.

Pathology.—Dr. J. T. Prendiville reported on the resected bowel as follows: "Sections were taken from the terminal ileum, the appendix, the gangrenous area of cæcum, and the terminal portion of the cæcum. In the affected area of the bowel the mucous membrane is seen to be completely destroyed along one-quarter of the circumference of the cæcum. In place of the mucosa there is a structureless granular mass of debris, into the base of which there is much fresh hæmorrhage. There is another small necrotic area in the mucosa in which similar changes can be seen. The remainder of the mucous coat appears normal. The entire submucous coat is greatly distended with œdema fluid, its fine connective-tissue fibres being torn apart in places. There is congestion of all its vessels and a large hæmorrhage in one region which appears to have been due to rupture of a medium-sized vessel. Early thrombotic changes can be seen in a few vessels. The muscle coats appear to be undamaged. The peritoneal layer shows considerable congestion of its vessels, and there is a large area of hæmorrhage between it and the bowel wall at one point."

DISCUSSION

Review of Literature

We have not been able to find any report of a similar case of injury due to lightning. Indeed, the only report of an abdominal injury from this cause seems to be that of Piulachs and Mir y Mir (1943): their patient was a young man who developed acute paralytic ileus immediately after being struck by lightning; this progressed for six hours and then abated, clearing spontaneously within twenty-four hours.

Jellinek (1932) published the case of a youth who, after touching a cable at a tension of 35,000 V, fell from a high mast and was found to have two perforations of the bowel. It is not clear, however, whether the injury was caused by the current or the fall. He also reported that a doctor, bending over a patient who was being radiographed, was injured by a spark from the apparatus, was thrown to the floor semi-conscious, and had the feeling that "his bowels were torn out of him." After four hours he had completely recovered.

Mechanism of Injury

In cases of lightning stroke the injuries may be the result either of the violence of the fall or of the lightning.

Spencer (1932) described four mechanisms of injury by a flash of lightning:

(1) The direct effect of the electric current on the nervous system and muscles, associated with much shock.

(2) Burns caused by superheated air.

(3) Effects of the "expanded and repelled air around the flash."

(4) The "sledge-hammer blow" given by the compressed air pushed before the current.

Mechanisms 2, 3, and 4 require consideration as regards the present case.

Burns from lightning are characteristic. They are linear or arborescent, and superficial because of the tremendous speed of the flash. Deeper burns may be caused by metal objects carried on the person. We have found no reference to internal burns resulting from lightning. Moreover, the regular contour of the necrotic patch in our case does not suggest such a cause.

To the third mechanism Spencer attributes the action of lightning when it strikes into a cavity anywhere—e.g., the blasting of the hollows of trees and the moving of masonry from its position. Likewise the bursting of clothing, boots, &c., which may be torn off the body, is "entirely due to the expansion and repulsion of the air in their fabric."

Injury by the compressed air pushed before the flash of lightning, Spencer says, is responsible for the tremendous blow which is recalled by some survivors. It is seen characteristically in the effusion beneath the scalp, generally without an external wound.

Other mechanisms, however, have also been invoked to explain the effects of lightning. Thus Blake Pritchard (1934), discussing the disruptive effects of electricity and lightning on the tissues of the nervous system, emphasises the rôle of electrostatic charges:

> When a conductor makes electrical contact with another body at a higher potential, the effect will depend on whether it is in a position to share its charge with a third body at a lower potential—e.g., the earth. If it is in electrical contact with the earth, a current will flow over or through it until it is at the same potential as the earth.
>
> On the other hand, if the conductor is not effectively "earthed," an electrostatic charge will accumulate upon it, and this is all concentrated upon its surface. Thus there is produced "a force acting outwards upon that surface, because each element of the surface, having a like charge, is repelled from all other elements, and the total effect is that the whole surface tends to expand away from the body in all directions . . . the distending or expanding forces on the surface will have the same effect as a proportionate sudden reduction in the atmospheric pressure acting upon the body."

Commenting on incidents described by Spencer (1932) Pritchard maintained that effects attributed by him to expansion and repulsion of air could be explained by electrostatic charge of the objects struck—e.g., if nearby objects became charged they were thrown apart in all directions. On the other hand, lightning might strike into a tent and cause so little commotion that its occupants slept throughout.

The relative incidence of effects due to the current and those due to electrostatic charge depend on how effectively the conductor can give up its charge (Pritchard 1934).

In our case a witness who was standing nearby was unaware of any movement of air and said that the hut did not shake. All he felt was a "light tap" on the side of the face where the flash struck him, though he was rendered temporarily deaf. The circumstantial evidence is therefore against "expanded and repelled air" being responsible. Pritchard's explanation, however, assuming that the witness received an electrostatic charge, could explain the effects. The fact that our patient was the only man wearing gum-boots made him more susceptible to becoming charged. On the other hand, that he was also capable of conducting the current to some extent was shown by his being burnt.

There is a resemblance between this type of injury and that due to blast, in that internal injuries may be caused by pressure changes without external marks of injury. In air blast the lungs are principally affected, but abdominal injuries may also occur (Cameron et al. 1942, Zuckerman 1941), the large intestine being most susceptible (Zuckerman 1941). There was no evidence of lung injury in our case. On the other hand, in underwater

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blast injuries the abdomen suffers more than the chest (Goligher et al. 1943). The lesions consist of rupture of the small or large intestine, or, more commonly, intramural hæmorrhages (Goligher et al. 1943). Wakeley (1943) states that, in his cases, most of the perforations were in the cæcum, the rent occurring (as in our case) on the outer side just lateral to the longitudinal band.

In our case the sudden distension was evidently not sufficient to rupture the cæcum at the time, but probably caused hæmorrhage and secondary necrosis. Such a sequence leading to delayed perforation has been described in connexion with underwater blast injuries (Gill 1943).

It should be noted that the mechanism we have suggested is one of negative pressure, whereas in air blast it is believed to be the positive pressure phase which is chiefly responsible for the effects (Zuckerman 1941) and in underwater blast there is only a positive-pressure wave to consider (Wakeley 1943).

SUMMARY

The case is described of a man struck by lightning and found to have gangrene of the cæcum.

The mechanism of the injury is discussed and an analogy with blast injuries suggested.

We wish to thank Mr. T. Max Pemberton for the opportunity of treating this case; and Dr. H. Loewenthal and Dr. V. Moskalenko for assistance in the preparation of this article.

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TREATMENT OF SEASICKNESS ABOARD OCEAN-GOING SHIPS

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TEMPORARY MAJOR, R.A.M.C.

Holling et al. (1944) and other war-time investigators showed that the incidence of seasickness can be reduced by about half if hyoscine is given by mouth in doses of gr. $^1/_{100}$. This work, however, was done on fit young men on short journeys and has only a limited application to ocean-going ships. Though Holling et al. reported an attempt to assess the value of hyoscine during long voyages, subsequent workers, such as Noble et al. (1947) and Tyler (1946), have not used ocean-going craft.

In 1947 I noticed that patients in a ship's hospital who were under treatment with anti-histamine drugs seemed unaffected by seasickness, and I gave these drugs to a few men reporting seasick. In April, 1948, I decided to compare the effect of "Anthisan" (pyranisamine maleate) with that of hyoscine.

Days were chosen when the sea was rough enough to incapacitate about 10% of the troops—which happens about two days a month with a ship of 15,000 tons. British other ranks off duty and desiring treatment for seasickness were asked to report to the medical-inspection room. There each man was given a tablet of anthisan (100 mg.) and a tablet of hyoscine gr. $^1/_{100}$, together with a form, to be filled up next day, saying which tablet he would like to have if he were again seasick. I explained to each man that he was not being "experimented with," in that both drugs would lessen his seasickness. The first tablet—alternately hyoscine or anthisan—was swallowed under my eye, and the other was taken away to be swallowed four hours later.

Date of trial	No. of persons	Order of taking drugs	Drug preferred
April, 1948 ..	40	20 hyoscine first	Anthisan, 8 Hyoscine, 8 No decision, 4
		20 anthisan first	Anthisan, 10 Hyoscine, 2 No decision, 8
July, 1948 ..	40	20 hyoscine first	Anthisan, 4 Hyoscine, 7 No decision, 9
		20 anthisan first	Anthisan, 6 Hyoscine, 6 No decision, 8
August, 1948 ..	54	28 hyoscine first	Anthisan, 12 Hyoscine, 11 No decision, 5
		26 anthisan first	Anthisan, 11 Hyoscine, 8 No decision, 7
Total	134		Anthisan, 51 Hyoscine, 42

Trials were made in April, July, and August, 1948, and replies were collected from over 100 men. Of these, 51 said they preferred anthisan and 42 preferred hyoscine (see table).

These results suggested that under the conditions described, when about 10% of the men were off duty complaining of seasickness, anthisan is at least as acceptable a remedy as hyoscine. Also anthisan is free from certain disadvantages of hyoscine, which is unsuitable for the outpatient treatment of old people, children, and persons exposed to the risk of heat exhaustion, and cannot safely be used over long periods. Subsequent experience in the treatment of several hundred cases of seasickness with anthisan has convinced me that, with the aid of this remedy and a strong friend, almost all seasick patients can be got up on deck—even when hyoscine has failed.

People liable to seasickness should not be given drugs until they begin to feel ill, for many of them anticipate their symptoms when the seas are still calm. At the onset of seasickness the patient should lie flat for half an hour and take 100 mg. of anthisan. When the anthisan has taken effect he should get up; while the sea remains rough he should eat light meals, restrict fluids, and keep warm. Anthisan 100 mg. should be taken three times a day as long as necessary. Enthusiastic treatment is, however, as essential as medicine.

I have to thank the Director-General, Army Medical Services, for permission to publish.

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". . . The social standing of the medicine man is of interest to us. He was, of course, greatly feared and on the whole hated rather than loved by the tribe, just as the modern medicine man may be hated and feared as a member of a powerful sect, though he may be loved and trusted by a few. The obvious way to deal with such a dangerous power was to rope it in and enlist it in the service of the tribe. What could be better than to employ and to pay the magician and thus hold him in the power of the tribe to do its bidding? These conditions were sufficient to induce the tribe to have its official medicine man, and no doubt similar feelings in society today account for the priority which the medical profession enjoys in schemes of nationalization."—HUGH MCLELLAND, *Med. J. Aust.*, March 12, p. 333.

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Reviews of Books

Current Therapy 1949

Editor: HOWARD F. CONN, M.D. Philadelphia and London: W. B. Saunders. 1949. Pp. 672. 50*s*.

THIS is an example of American efficiency at its best: we in this country have a long way to go before we produce a coöperative effort such as this in such good time. That it is up to date is shown by the presence of aureomycin, chloromycetin, and vitamin B_{12} in the index. The list of contributors is sufficient guarantee of its reliability: the consulting editors include Perrin H. Long, William J. Kerr, and Cyril Sturgis, while among the contributors are to be found names such as Bargen, Dameshek, Harry Gold, Smithwick, Paul White, and Russell Wilder. More than one contributor may write on a given subject, and the editor has made no attempt at unification of divergent views. This is well illustrated in the section on the common cold, where one author mentions the possible use of chemotherapy and vasoconstrictors, while the other says dogmatically: "never give sulfonamides or penicillin in any form" and "all local vasoconstrictors are irritating. . . . *Avoid their use whenever possible.*" The inquiring reader is thus given an opportunity of considering alternative forms of treatment before coming to a final decision for himself. As a work of reference for clinicians, the book is very good value for money.

Foundations of Psychology

Editors: EDWIN G. BORING; HERBERT S. LANGFELD; HARRY P. WELD. London: Chapman & Hall. 1948. Pp. 632. 24*s*.

THIS important compendium is edited by the professors of psychology at Harvard, Princeton, and Cornell. The field common to physiology and psychology is thoroughly covered early in the book and the factual material as a whole is probably unequalled in extent and accurate presentation. It takes in most of what would be described as laboratory psychology, and includes such things as the investigation of industrial efficiency, the measurement of public opinion by devices such as the Gallup poll, and the study of racial prejudice. Yet it seems to lack the human touch. The editors tell us that "In 1948 the important thing about the organism is not that it is conscious, but that it reacts to stimulation"; and it is clear from this and other passages that behaviour and conditioned reflexes are for them the basis of psychology. Both Watson and Pavlov built up their respective theories with the avowed aim of making unnecessary such concepts as mind, consciousness, or the unconscious, these being regarded as outside the sphere of true science, which demanded a psychology without a psyche. Many British psychologists regard this appeal to the conditioned reflex as a spurious solution, or an ingenious evasion, of the basic problem of the body-mind relation. Otherwise the book stands as an up-to-date presentation of the subject from one angle. It is well illustrated and well got up, and the price is remarkably low.

Aero-Otitis Media and Aerosinusitis

GUNNAR K: SON ASCHAU, Uppsala University. Uppsala: Almqvist and Wiksells Boktryckeri. 1948. Pp. 93.

Dr. Aschau briefly reviews, in English, clinical observations on aero-otitis media in aviators, compressed-air workers, and subjects in low-pressure-chamber tests. He notes that pathological studies and animal experiments have so far been few, and that most of our knowledge of these conditions is based on clinical findings, including those of Sydney Scott, E. D. D. Dickson, J. E. G. McGibbon, and Geoffrey Bateman. As far as the middle ear is concerned, no pathological or anatomical studies have been made in man, and available data about aerosinusitis are limited to some limited studies of aerohæmatoma of the submucous tissues; this lesion was seen at operation in two cases, and verified histologically. H. G. Armstrong and J. W. Heim have suggested that the diameter of the eustachian tube (perhaps because of catarrh or inflammation) may not be wide enough to allow the pressure in the middle ear and sinuses, on rapid recompression, to rise as fast as the pressure outside increases. But this leaves several questions unanswered. Why do an increase and a decrease of the ambient pressure both produce the same clinical picture? If rhinopharyngitis and partial obstruction of the tubes are commonly causal factors, why is suppurative otitis seldom or never seen as a complication? Why should aero-otitis last sometimes up to four weeks in spite of treatment by pressure-equalisation? All these questions suggest that some factor other than full patency of the tubes must come into play. Dr. Aschau notes that parachute jumps—in which changes of pressure are particularly rapid—very rarely produce either condition. Some of his experiments were done on rats, but as these animals are particularly subject, it seems, to cold-in-the-nose (without, however, giving any external evidence of their intranasal inflammation) he turned more confidently to rabbits, whose eustachian tubes have a closer resemblance to those of man, and who are not given to colds. He found that mucosal changes in the middle ear and sinuses similar to those associated with variations in ambient pressure were equally well induced by oxygen deficiency and oxygen poisoning; and he thinks they are part of a general physiological process. His findings are illustrated by some 44 photomicrographs, and the work deserves the attention of those interested in aviation medicine.

Science in Liberated Europe

J. G. CROWTHER. London: The Pilot Press. 1949. Pp. 336. 18*s*.

Mr. Crowther made this survey of scientific affairs in France, Denmark, Holland, and Czechoslovakia during a tour in 1946. It shows how great was the effect of the occupation on science and scientists—for work was carried on only under the greatest difficulties, contact with foreign countries was cut off, and scientists were persecuted. Whereas America and Britain have increased their endowment of science prodigiously in the last decade, these countries have lost nearly everything, and are only now beginning to rebuild; but they have a very long way to go. In France, scientific research is still particularly badly paid, and realisation that scientific knowledge is part of a nation's capital is dawning very slowly. There is a deal of useful and important information in this book, but it is so disjointed and artless as to be almost unreadable. It is as if old lecture notes have been slightly touched up and offered at a high price.

Racial Variations in Immunity to Syphilis

CHESTER NORTH FRAZIER, M.D., D.P.H.; LI HUNG-CHIUNG, M.D. Chicago: University of Chicago Press. London: Cambridge University Press. 1948. Pp. 122. 14*s*.

THE comparative reactions to the virus of syphilis in three races—Chinese, American negro, and American white—are here set out by the professor and assistant professor of dermatology and syphilis at the Peiping Union Medical College. They have had the advantage of access to the records of Dr. Earle Moore's clinic at the Johns Hopkins Hospital, Baltimore, and from this combined material it seems that the prevalence of the disease in hospital patients was 6% in China, 7% among the whites in Baltimore, and 22% in negroes. No difference could be detected between the *Treponema pallidum* of China and that of the U.S.A., nor did they differ in tissue selectivity. In some respects syphilis was a less serious disease in the Chinese, as was shown by the frequency of latent infection, which may be taken as a measure of resistance. On the other hand acute periostitis and acute meningitis in the early stages of the disease were fifteen times more common in Chinese than in whites or negroes. Tabes and general paralysis were seen in the same proportion of Chinese and whites, but only in a third as many negroes. The mildness of the disease in females was the same in all three races.

The study on the whole showed that syphilis varies little between races. Much careful statistical work has gone to the preparation of this monograph; but the results, though interesting to the specialist, have little bearing on practice.

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THE LANCET

LONDON: SATURDAY, MAY 14, 1949

Trainee Specialists

FOR the would-be specialist these are troubled times. Now, as always, there is no lack of young men and women willing to set a long period of arduous apprenticeship, with the chance of eventual failure, against the hope of recognition in their chosen field. That the number waiting is now especially large is due mainly to the war, which caused many to defer the training they would otherwise have taken between 1939 and 1945. But there are other reasons—notably the disinclination of hospitals in the last year or two to make senior appointments until the establishment under the new service is known. The result of this hesitation is that some who are fully competent to fill a senior appointment remain in the ranks of what one correspondent has termed "the eternal registrars." Many have been led to join these ranks because of the diminishing popularity and prestige of general practice, and because of the belief, possibly fortified by the wide distribution of Government grants to trainees in supernumerary posts, that the new service will afford an opening for more specialists than ever before. Whether this hope is justified will not be known until the task of the reviewing committees is completed and the regional boards have decided on their new arrangements; and the latest information unfortunately suggests that in most regions the work of investigating the claims and wishes of specialists already employed is unlikely to be finished before the autumn. Whether senior posts will be found for all trainees who are competent to take them, no-one can tell. Certainly vacancies will be insufficient unless the present establishments are expanded. Simple arithmetic tells us that where the number of specialists is to be kept constant and the training-period in a registrarship or similar post is five years, the ratio of doctors thus engaged to full specialists should not much exceed 1 to 4, even allowing for wastage. In the future it will rest with the regional boards and the boards of governors to maintain the proper balance so that no suitable candidate, having completed his training, is without employment; and perhaps that is partly why some boards are already opposing fresh claims for the appointment of registrars.

Meanwhile, the present delay has caused considerable restiveness, for those who hope to fill the new posts are of an age at which in other professions they would have established themselves; and often they have family responsibilities. In one largish group the average age of trainees was found to be $31\frac{1}{2}$ and of first assistants 37 years. They have reason therefore to press the question: Am I or am I not to get my chance? To some the hope is receding, for in the past two months supernumerary appointments have been unexpectedly terminated at short notice, as part of the hospitals' economy drive. The value to the hospitals of these supernumeraries varies widely. At some, notably in the teaching centres, their going would hardly be noticed, while at others, and especially some of the former local-authority institutions where the old establishment does not tally with new demands, their withdrawal would mean lost efficiency and possibly a longer stay for patients. In any case, is it sensible to allow these trainees, on whom the nation's money has been spent, to scatter a few short months before the hospitals' new complement of staff is made known? In at least one region the hospital board has assured supernumeraries that in filling new posts preference will be given to them, and the board will thus be promoting men whose quality is already known. Elsewhere no such assurance has been given.

The trainee is beset by other doubts and difficulties. In accordance with the Spens recommendations, junior posts and those who will occupy them are each being sorted into three grades; yet the criteria by which these gradings are to be determined have not been announced, and no doubt they will vary from one area to another. Sooner or later the trainee reaches a stage when he wonders whether to take another hospital post or to turn aside for six months or a year in order to gain a higher qualification; but at present he has no idea which course is more likely to secure his advancement. (One suggestion is that the trainee's grading should be determined on a system of points, with a given number for each year since qualification, for each type of post already held in the Services or civilian life, and for each higher qualification. But obviously the inelasticity of such a scheme would tell hard on some.) To deal with such questions, as well as the larger ones we have indicated, trainee specialists in a number of regions have formed themselves into groups; and these groups are now affiliated in a national body which hopes, possibly in alliance with the British Medical Association, to speak for all junior hospital doctors. One aim is to secure improved representation for registrars on statutory bodies; but the new organisation may find itself with more immediate preoccupation, for many trainees fear that while the letter of the Spens report may be fulfilled, its spirit may be defied, in the name of economy, by an establishment which includes an unduly large proportion of junior posts and of the medium appointment of senior hospital medical officer. Trainees are aware, too, that being numerous and often needy, they are not well placed to resist such an expedient. This anxiety is of course shared by some of their senior colleagues.

Remedies for Seasickness

UNTIL a few years ago the variety of drugs recommended for seasickness was mute testimony to our ignorance of its cause and cure. Involvement of the labyrinth was generally recognised, but otherwise little was known. This lack of knowledge seemed to act as a spur to speculation, and each armchair hypothesis was usually accompanied by yet another form of treatment. Adequate testing of the different drugs was difficult in peace-time, and the therapeutic obscurity was not resolved until the late war made it possible to test the various remedies on troops under controlled conditions. In 1944 HOLLING, MCARDLE, and TROTTER[1] showed that, of a number

1. Holling, H. E., McArdle, B., Trotter, W. R. *Lancet*, 1944, i, 127.

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of remedies tested, only those containing belladonna alkaloids had any significant effect, and that of these hyoscine was the most satisfactory. The efficacy of hyoscine, either alone or in combination with *l*-hyoscyamine, has been amply confirmed, for seasickness by TYLER [2] and by NOBLE, SELLERS, and BEST,[3] and for airsickness by LILIENTHAL.[4] Hyoscine when given in a dose (0·6 mg.) that led to negligible side-effects prevented about 50–60% of cases of motion sickness; its efficacy in curing established cases was less carefully studied.

All who are interested in the condition will welcome an impressive report on a new treatment for motion sickness evolved by GAY and CARLINER, of Baltimore.[5] The new drug—'Dramamine' (β-dimethylaminoethyl benzohydryl ether 8-chlorotheophyllinate)—appears to be outstandingly effective both in prophylaxis and cure. It belongs to the anti-histamine group of compounds—a group which had not previously been used in the therapy of motion sickness. Quite independently MCEVEDY, whose results are described in this issue, has noted the value of another anti-histamine drug, 'Anthisan' (pyranisamine maleate), in the treatment of seasickness. The value of both drugs in motion sickness was discovered by chance. MCEVEDY found that soldiers on board a troopship under treatment with anti-histamine drugs were free from seasickness. GAY and CARLINER, who were testing dramamine in cases of urticaria and hay-fever, happened to have a patient who had always been highly susceptible to car-sickness and noticed that this condition as well as her urticaria was relieved by the drug. It was tried on other sufferers and proved so successful that a full-scale study of its effects on seasickness was undertaken on board a transport carrying 1366 troops from New York to Bremerhaven; 485 men in four adjoining compartments and subject to the same motion were selected for special observation. Fortunately for the experiment, the sea was rough throughout the voyage. Dramamine, 100 mg. every five hours and before retiring, was given for the first forty-eight hours and was found strikingly effective in prophylaxis; of 134 men receiving the drug only 2 became seasick, whereas of 123 men given a placebo of lactose 35 became sick. Dramamine was no less effective in treatment: of 228 men who did not receive any prophylactic dose, 48 became seasick; 15 of these were given dramamine and 14 recovered within half an hour. Of the control group of 33 cases who received a placebo, no fewer than 19 recovered within twelve hours and needed no further treatment for the remainder of the voyage; presumably their recovery was due, partly at least, to the normal process of adaptation to the motion of the ship. Adaptation of this kind was apparently prevented to some extent in those receiving dramamine; of the 134 men taking it prophylactically, 41 became seasick when its use was discontinued. All but 1 recovered within half an hour when it was given to them again. When it was omitted a second time, the same 41 men became seasick, and once again they were cured by dramamine. A vivid description is given of the ship twelve hours after leaving New York. Many of the soldiers were semi-conscious, and the corridors and latrines were indescribably revolting. It was decided to test dramamine on all cases of seasickness. The semiconscious had to be given the drug per rectum; yet within an hour they were able to retain liquids and solid food. In all, 300 cases were treated, and complete relief within an hour or less was obtained in 96%.

STRICKLAND and HAHN have [6] studied the effects of dramamine in the prophylaxis of airsickness. Two equal groups of 108 men received either dramamine or a placebo; of those receiving dramamine 31 became sick, and of the control group 60. Clearly the drug was less efficacious in airsickness than in seasickness, and in this condition a comparison with hyoscine would be useful. In the case of anthisan MCEVEDY has made such a comparison with hyoscine on 134 seasick soldiers. Each man was treated with alternate doses of anthisan 100 mg. and hyoscine 0·6 mg., and the men were asked which drug they preferred. Of those who gave an opinion, 51 preferred anthisan and 42 hyoscine. He has since found anthisan valuable in several hundreds of cases of seasickness.

Neither GAY and CARLINER nor MCEVEDY discuss the possible mode of action of the drugs. At first blush it looks as though a local overproduction of histamine, possibly in the labyrinths, might be responsible for seasickness. But the action of the anti-histamine drugs is not confined to blocking the tissue receptors of histamine. Their pharmacology is still imperfectly understood, but in a recent review HUNTER and DUNLOP [7] list a variety of other actions of these drugs. They include anti-acetylcholine, sedative, and local-anæsthetic effects, while some of the compounds potentiate and others antagonise the action of adrenaline. The common side-effects, drowsiness and dizziness, suggest an action on the central nervous system—a suggestion supported by the effects in animals of lethal doses of some of these drugs. Curiously enough, nausea and vomiting are among the side-effects. If the results of GAY and CARLINER can be confirmed, a dramatic advance will have been made in the treatment of motion sickness. The anti-histamine drugs have been found to improve parkinsonism—a condition also improved by hyoscine. It will be interesting therefore if dramamine, like hyoscine, also proves helpful in Menière's disease.

Edward Jenner

b. MAY 17, 1749

> "The deviations of Man from the state in which he was originally plac'd by Nature seems to have proved to him a prolific source of Diseases. From the love of splendor, from the indulgences of Luxury, & from his fondness for amusement, he has familiariz'd himself with a great number of animals which may not originally have been intended for his associates. The Wolf, disarm'd of ferocity, is now pillow'd in the Lady's lap. The Cat, the little Tyger of our Island, whose natural home is the Forest, is equally domesticated and caress'd. The Cow, the Hog, the Sheep & the Horse, are all for a variety of purposes brought under his care & dominion."

So wrote JENNER, at the opening of the original draft [8] of his classic treatise on cowpox. The little

2. Tyler, D. B. *Amer. J. Physiol.* 1946, **146**, 458.
3. Noble, R. L., Sellers, E. A., Best, C. H. *Canad. Med. Ass. J.* 1947, **56**, 417.
4. Lilienthal, J. L. jun. *J. Aviat. Med.* 1945, **16**, 59.
5. Gay, L. N., Carliner, P. E. *Science*, 1949, **109**, 359; *Bull. Johns Hopk. Hosp.* May, 1949.
6. Strickland, B. A. jun., Hahn, G. L. *Science*, 1949, **109**, 359.
7. Hunter, R. B., Dunlop, D. M. *Quart. J. Med.* 1948, **17**, 271.
8. An Inquiry into the Natural History of a Disease known in Glostershire by the name of the Cow-pox. First published in *The Lancet*, 1923, i, 137.

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quotation sketches the man of whom it was said that "his neighbours would accompany him twenty or thirty miles in a morning to enjoy his conversation." [9] He might have added curiosity to the list of weaknesses that have familiarised men with animals, for it was a potent cause of his own delight in them. At Chantry Cottage, in his native village of Berkeley, where he practised all his life, he had a garden roamed by tame pheasants, sheldrakes, and other birds, and an eagle sent him from Newfoundland. At the request of JOHN HUNTER, his former teacher and close friend, he studied the doings of young cuckoos to such purpose that, until others corroborated his findings, he was roundly accused of lying. HUNTER'S voracious demands for more animals to study went north, south, east, and west—to the antipodes, to the oceans—but a great many of them went to Gloucestershire. His letters pressed JENNER to procure him "a large porpoise for love or money," fossils, salmon-spawn, eels, young blackbirds, an old cuckoo, white hares from Newfoundland, and "more hedgehogs." [10] He even concluded a letter of sympathy for a disappointment in love by asking JENNER to find out how much weight a hedgehog loses in its winter sleep. Together they studied hibernation, and found that hedgehogs can still live at freezing-point with a pulse-rate of 14 a minute and no perceptible respiration, and, provided they are kept cold enough, can be electrically shocked without signs of waking.

The discovery of vaccination was in line with all this close interest in natural history; for JENNER'S curiosity led him to test the truth of the belief, current in Gloucestershire, that milkers who caught cowpox from their beasts could never afterwards take smallpox. His case-notes are little models of accurate observation and recording; again and again he used the current method of smallpox inoculation on those who had previously had cowpox, and always found them immune. It was not until he had repeatedly assured himself of this that on May 14, 1796, he made his famous experiment and inoculated little JAMES PHIPPS with lymph from the hands of the milkmaid, SARAH NELMES; and what a famous rumpus followed the five-minute act. The practice of vaccination, and with it his fame, spread fast, especially on the Continent (May 14 became an annual festival in Berlin) and in America; at home he met some opposition. But his natural simplicity and honesty had safely immunised him against the harms of fame, and opposition only moved him to work all the harder to spread the great benefit of his discovery. His joy was in the prospect "of being the instrument destined to take away from the world one of its greatest calamities." He spent his time and his money on the task, and the sums voted him by Parliament on two occasions, though substantial, did not suffice to restore all he had spent. The cow, as he put it, had not fattened him. "My state of domestication is the same now as it was before I cultivated her acquaintance so closely; except that then I had horses to my carriage, and that now I have none. . . . To know anything about me you should come down and inquire of my neighbours what I am and what I was." Those notoriously exacting critics were always his warm partisans.

9. Baron, J. Life of Jenner. 2 vols. London, 1838.
10. Drewitt, F. D. Life of Edward Jenner. London, 1931

Annotations

LONDON RESIDENCE FOR SURGEONS

THE postgraduate student commonly has difficulty in finding in London somewhere to live which is at the same time suitable and within his means; and this impediment deters some overseas students from coming to England.

An important step towards countering this obstacle has been taken by the Royal College of Surgeons, which last week opened accommodation for 22 students in two adapted houses immediately adjoining the college. Redecorated in fine taste and comfortably furnished, these houses are sure to be constantly filled from now on; and the first group of residents includes some from Canada, Australia, New Zealand, and South Africa, as well as from Ireland and from the provinces of England. Residents will for the most part be studying for the primary or final fellowship examination; but the accommodation is equally open to more senior graduates.

This is more than a hostel; the college have no mind to enter business as hoteliers. The second grave disadvantage suffered by the postgraduate in the capital is that normally he seldom has the chance for informal meetings with his instructors. The college already has a lively social life of its own, centred on the college club, at which members can lunch and will now be able to dine. By living beside the main building residents will be able to make informal contact with the leaders in surgery whom they might otherwise see and hear only in the lecture-theatre. In other words, the purpose is to establish a true collegiate life.

The opening of this new accommodation is the first step in a larger plan; for soon, on the college's opposite flank, work is to begin on the Nuffield College of Surgical Sciences, which will take about a hundred residents. The Royal College of Surgeons is fortunate in having a large site on which to assemble all its buildings; but this would not have availed without a large measure of enterprise. The news that other bodies interested in postgraduate teaching were equally anxious to welcome them would encourage still more graduates at home and abroad to make the trek to London.

OBSERVATIONS ON VITAMIN A

THE persistently growing incisor of the rat, and the bone about it, are convenient material for the study of agents affecting growth of dentine and bone, since the same sequence of appositional and resorptive changes takes place continually. Vitamin-A deficiency was thought by Schour and his colleagues [1] to affect specifically the odontogenic epithelium; and Irving [2] has found that the change involves mainly the labial dentine. Irving also describes the results of excess of vitamin A. Increment of dentine is subnormal; but of greater general interest are the changes in the alveolar bone. Irving's explanation of these changes differs in several respects from those put forward by Mellanby [3] and particularly by Wolbach.[4] Bone-formation is greatly reduced and the bones become thin; and Irving ascribes this to reduced activity of the osteoblasts while osteoclasia proceeds normally. With deficiency of the vitamin there is over-production of new bone both at normal sites of apposition and of resorption; but Irving believes that in the early stages there is some compensatory increase in activity of the osteoclasts. He suggests that in bone-formation vitamin A acts primarily upon the osteoblasts; excess of the vitamin depresses them, whereas deprivation permits disorderly over-activity.

1. Schour, I., Hoffman, M. M., Smith, M. C. *Amer. J. Path.* 1941, **17**, 529.
2. Irving, J. T. *J. Physiol.* 1949, **108**, 92.
3. Mellanby, E. *Ibid*, 1947, **105**, 382.
4. Wolbach, S. B. *Proc. Inst. Med. Chicago*, 1946, **16**, 118.

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Unlike Mellanby, he holds that deficiency of vitamin A has no effect upon the osteoclasts, and that the effect of excess of vitamin A upon them is secondary. In the rat the changes are less pronounced in teeth than in bone—a circumstance that may be related to the high biological importance of the incisors to the rodent.

HICCUP

HICCUPING is sometimes tiresome and always purposeless. It consists of intermittent spasmodic contraction of the diaphragm accompanied by closure of the glottis; and the familiar "hic" sound is due to sudden inspiration terminated abruptly as the vocal cords come together. Hiccups may be a reflex response to stimulation of afferent pathways to centres in the cord or medulla; or they may arise from stimulation of the centres themselves, or of the efferent pathways, of which the chief is the phrenic nerve. At the same time there is sometimes spasm of the intercostal and accessory muscles of respiration, which are controlled by the respiratory centre.

Only the central portion of the diaphragm is innervated by the phrenic nerve. This nerve arises mainly from the 4th, with branches also from the 3rd and 5th, cervical nerve; it contains both motor and sensory components and is accompanied by sympathetic fibres. The lateral portion of the diaphragm is supplied by the lower five or six intercostal nerves. Probably hiccup is most commonly due to stimulation of the sensory endings of the phrenic nerve; this nerve, it may be noted, is connected with the cœliac plexus, which itself is widely connected with other intra-abdominal sympathetic plexuses. It has been suggested that hiccup is often due to irritation of the diaphragmatic sympathetic plexus; and with irritation of the gastro-intestinal tract sensory impulses transmitted through the vagus nerve may be responsible. Thus through these different pathways hiccup may be precipitated by impulses from the œsophagus, stomach, intestine, pancreas, liver, biliary system, or peritoneum; from the larynx, bronchi, lungs, pleura, or diaphragm; and in the mediastinum as a result of inflammation or pressure from tumour, enlarged glands, or aneurysm. It may also originate from direct irritation of the phrenic nerve or diaphragm. Sometimes the irritation is central, due to encephalitis, meningitis, neoplasm, and possibly toxins (for example, in uræmia). Alcohol may induce an attack by central or peripheral action. Crises of hiccup have been observed in tabes [1]; and hiccup may also be psychogenic, in which case it ceases during sleep and sometimes while eating.

Over two hundred different treatments have been proposed.[1] Homely therapy is often as effective as any—for example, such stimuli as a slap on the back (which should be sudden and surprising enough to cause initial resentment), traction on the tongue, tickling the nares, painting the uvula with iodine, inhaling smelling-salts, and drinking neat whisky. Both holding the breath and deep breathing have their advocates; and inhaling carbon dioxide is sometimes effective. When a gastric cause is suspected, alkalis, aromatic oils, and carminatives may be tried; and occasionally aspiration or lavage of the stomach or induction of vomiting may be warranted. For the relief of abdominal distension neostigmine and vasopressin have been used. With the distressing postoperative hiccup, action is imperative; and here the usual measures often disappoint. Bromides, barbiturates, opium derivatives, and hyoscine are commonly used, and even general anæsthesia has been recommended; a firm abdominal binder will help to minimise fatigue. In some cases with dehydration Peet [2] has found the liberal administration of intravenous fluids effective. Antispasmodics may be tried—for example, atropine, or amyl nitrite which has been the subject of an enthusiastic report.[3] Amphetamine, which is known to relax the smooth muscle of the gastro-intestinal tract, has been used with success in two cases [4]; while another antispasmodic, benzyl benzoate, has been employed as a 20% solution in doses of 2 ml. by mouth four-hourly.[5] Arguing on the analogy of the effects of cinchona alkaloids on striated and on cardiac muscle, Bellet and Nadler [6] have lately used quinidine for intractible hiccup. Of 9 cases where the customary methods had failed, quinidine arrested the paroxysms in 6, and was partly successful in a further 2. The dose recommended is gr. 9 by mouth or intramuscular injection, if necessary repeated 2–3 times at hourly intervals.

The possibility of treatment by interrupting the phrenic nerve was recognised more than a century ago; in 1833 Shortt,[7] of Edinburgh, succeeded in 2 cases by blistering the surface of the neck over the origin and course of the nerve. Shortt's review shows how little has been added to our knowledge in the past hundred years. Since then interruption of the nerve has been achieved in various other ways, including digital compression of the cervical portion between the heads of the sternomastoid muscles, galvanic and faradic currents to the neck, freezing with ethyl chloride, traction on a ligature round the nerve, and procaine block. If all else fails, the nerve can be crushed. Weeks [8] reports the application of this treatment to a case where hiccup was apparently due to right-sided diaphragmatic pleurisy, and only the nerve on that side was crushed; he suggests that the diaphragm should be screened in an attempt to determine which side is at fault. Rarely even bilateral phrenicotomy fails; and then the hiccup may be due to spasm not of the diaphragm but of the intercostal and accessory muscles of respiration.

DRUG-ADDICTION

MOST of us retain from our student days the belief that addicts are difficult to treat, will seldom complete a cure, and are liable to relapse. Dr. P. O. Wolff's survey,[9] first published by the League of Nations in 1945–46 and later republished by the World Health Organisation, bears out these generalisations. Like all generalisations, however, they are too simple.

Dr. Wolff deals almost entirely with addiction to morphine, opiates, and opium, reviewing methods of treatment as numerous as they are imperfect—slow gradual withdrawal, rapid withdrawal, sudden withdrawal without other medication (the "cold turkey" method, so named from the state of the patient's skin), sudden withdrawal with palliative treatment, "reductive dosage ambulatory treatment," withdrawal during narcosis, the Modinos method, treatment with endocrine preparations especially insulin, treatment with lipids and related substances, symptomatic treatment, psychotherapy during the recovery phase, aftercare, and reablement. A few pages at the end cover addiction to cocaine and marihuana. The reader gets no peptonised digest, but a number of major facts emerge conspicuously from the review. It seems that about a quarter of the patients addicted to morphine or opiates are capable of recovering in favourable circumstances. Most of these are people who became addicts accidentally because they were given opiates for pain. They had good stable characters before they acquired the habit, and

1. Byrnes, C. M. *Bull. Johns Hopk. Hosp.* 1936, **56**, 264.
2. See Campbell, M. F. *Amer. J. Surg.* 1940 **48**, 449.
3. Nairn, R. C. *Lancet*, 1947, i, 829.
4. Shaine, M. S. *Amer. J. med. Sci.* 1938, **196**, 715.
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6. Bellet, S., Nadler, C. S. *Amer. J. med. Sci.* 1948, **216**, 680.
7. Shortt, T. *Edinb. med. J.* 1833, **39**, 305.
8. Weeks, C. *Ann. Surg.* 1931, **93**, 811.
9. The Treatment of Drug Addicts. Reprinted from the *Bulletin of the Health Organisation*, League of Nations, 1945–46, **12**, no. 4, by the Interim Commission of W.H.O.

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with proper help are able to recover their former qualities and avoid relapses. A few people take small doses, usually of morphine, daily for years; they have no wish to increase the dose, appear to be none the worse for it, and indeed only work their best while it is continued; but they are rare. Of all methods of treatment, "cold turkey" is the cruellest, and the most likely to prevent a relapsed patient from ever taking a cure again. Sudden withdrawal supported by palliative treatment, and especially by narcosis, is good and effective; and so is rapid withdrawal, in which the dose is reduced much faster than the patient realises. The dread of the last dose is overcome by telling him that he has had no morphine for 48 hours at the moment when, in fact, the final minute dose has just been given. Slow methods of withdrawal merely spin out the agony without alleviating the dread of the last dose; and ambulatory methods are quite useless, since the doctor has no means of checking whether the patient is getting additional supplies from elsewhere. Moreover, according to S. D. Hubbard, in most cases "all that can be done is to reduce the amount of drug taken to a minimum, after which the doctor becomes in effect a legalised purveyor of his drug to the addict."

Addicts must always be treated in an institution; but it will seem strange to British readers to find Dr. Wolff advocating legislation to compel them to remain there until they have completed their cure—strange, because we do not welcome the idea of compulsory treatment even for those who can infect others with, say, the organisms of venereal disease, or tuberculosis. It is usual to think of the addict as dangerous to no-one but himself; yet it must be recognised that addicts are found mainly among criminals and that they often take an active part in the "dope" trade.

The Modinos method of treatment consists in blistering the patient and injecting him with the blister fluid, on the theoretical assumption that he will then become "hypersensitive" to his drug and reject it. The method is painful but simple, and some people report good results from it; others have done as well with injections of normal saline. Wolff concludes that the value of the method lies not so much in the contents of the blister as in the mystery attached to it. Since addicts are often highly accessible to suggestion (which increases their liability to relapse) he insists that a cure is not complete until adequate psychotherapy has helped the patient to overcome the emotional difficulties which lie behind the addiction. The earlier the case, the greater the chance for such moral reablement.

PSYCHIATRY IN THE GENERAL WARD

THE drawbacks to treating mental patients in the wards of a general hospital are so readily imagined that the advantages seldom get much of a hearing. Many doctors, and even more nurses, oppose the idea outright. Dr. James Carson and Dr. Howard Kitching, who describe on another page a successful experience of psychiatry in a general ward, were faced at the outset with a good deal of opposition from the nursing staff. This derived, as might be supposed, from an abstract fear of mental illness, but it melted in the presence of actual patients. As commonly happens where treatment is active and doctors keen, the nurses became warmly interested and ready to take responsibility which at first they had shunned.

Since the patients were admitted to a general ward, they had to be very carefully selected. The well-being and peace of the other patients had to be considered, and unsuitable mental patients, if admitted by mistake, had to go. This must be considered a weakness of the scheme, for a patient does not cease to be a problem because he is discharged from a hospital ward, and responsibility for his further treatment must rest somewhere. Dr. Carson and Dr. Kitching, however, were not in a position to solve this problem: they had to do what they could, with the chance presented to them, choosing depressed and psychoneurotic patients who would not disturb others and who were likely to respond quickly to physical methods. Electrical convulsant therapy was largely used; sedatives, prolonged narcosis, and modified insulin therapy were also available; but any deep psychotherapy was out of the question. Two months after treatment some 70% of 106 patients with affective disorder described themselves as recovered or improved. The experience has justified the experiment, Dr. Carson and Dr. Kitching believe, for the patients have greatly valued the chance of being treated like other sick people in a general hospital, and without this opportunity some at least would have remained untreated till much later in their illness.

STRONGYLOIDES IN EX-PRISONERS-OF-WAR

FIRST discovered by Normand in 1876, the nematode *Strongyloides stercoralis* has since been recognised as a common parasite in hot moist climates; and it is particularly prevalent in the areas of the Far East invaded by Japan in the late war. British workers have hitherto regarded bowel infestation with this worm as of little, if any, pathological significance, whereas elsewhere and notably in the U.S.A. it is believed to have considerable potential importance.

To man the infective stage of the parasite is normally a filariform larva which develops from a rhabditoid larva outside the host; this actively penetrates skin or mucous membrane and enters the blood-stream, in which it is carried to the lungs. Here it settles in the alveoli, where mature male and female worms may develop, the latter ovipositing in the bronchial mucosa; but more commonly the larvæ ascend the respiratory passages and descend the œsophagus to the small intestine, where the gravid female worms burrow into the mucosa of the gut wall and deposit eggs which rapidly hatch rhabditoid larvæ. These rhabditoid larvæ usually escape to the lumen of the intestine and are passed in the fæces to the exterior, there to undergo an exogenous cycle in soil. It seems, however, that some do not escape in this way and do not even leave the intestinal mucosa, but are carried in blood-vessels to the lungs, from which the cycle is repeated—a process called by Napier[1] "direct endo-autoinfection." Alternatively, the rhabditiform larvæ, though not escaping into the lumen, may develop into filariform larvæ which repenetrate the mucosa lower down the bowel, again recommencing the cycle of infection; this Napier refers to as "indirect endo-autoinfection." Or the rhabditoid larvæ in fæcal matter contaminating the skin of the perianal and perineal regions may develop to the infective filariform type and penetrate the skin, once more initiating a cycle of endogenous reinfection ("exo-autoinfection").

The significance of these various means of autoinfection is that the worm population in the host may be increased without exogenous development of the parasite; no other human helminth parasite is known to increase in man in this way. As Napier says, the variations in the cycle of *S. stercoralis* in man are such that larvæ may sometimes be absent from the stools of an infested subject; detection of the worm then depends on repeated examination. The exogenous cycle is also subject to variation. The rhabditoid larvæ which escape to the exterior in the stools become filariform when they reach soil. They may remain in this form, and are of course infective if they gain access to unprotected skin or mucous membranes. Or these free-living filariform larvæ may develop to free-living

1. Napier, L. E. *J. trop. Med. Hyg.* 1949, **52**, 25, 46.

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adult male and female worms which produce further broods of larvæ in soil; and this cycle may be repeated several times.

Under the conditions in which prisoners lived and worked in Japanese internment camps, many became infected with *S. stercoralis*, particularly among the military prisoners working on the railway in Siam; and on repatriation a high percentage of these were found still to harbour strongyloides. The symptoms of which these men complain are indefinite; but both Napier and Caplan [2] comment on curious cutaneous eruptions in association with the parasite. These eruptions have recurred periodically, and in some cases the recurrences have now continued for several years. The mechanism of their production is uncertain, but in view of the usual distribution of the lesions in the bathing-drawers region it is suggested that "exo-autoinfection" affords the most satisfactory explanation, even though no larvæ have been recovered from any of these skin lesions. Unhappily the methods of eradicating this parasite are unsatisfactory.

ANÆMIA IN RHEUMATOID ARTHRITIS

IN the study of rheumatoid arthritis attention has centred mainly on the articular and visceral lesions; and little work has been done on the anæmia that commonly accompanies this condition. Nilsson,[3] in a comprehensive study, suggests that this anæmia is akin to that of chronic sepsis. Formerly hæmolysis was thought to play a large part in the production of anæmia in chronic sepsis, but quite recently the hypothesis of impaired hæmoglobin synthesis has been put forward. Some of those who favour this hypothesis have demonstrated increased excretion of coproporphyrin I and III in the urine and fæces [4]; while others have recorded an increased erythrocyte protoporphyrin, which, they suggest, reflects disordered hæmoglobin synthesis. The hæmolysis theory still has its exponents, however, the chief of whom is Heilmeyer. He attributes the anæmia to hæmolysis largely because of the increased urinary excretion of urobilin and urobilinogen and the erythroblastic bone-marrow and raised reticulocyte-count. Nilsson confirms these findings in respect of rheumatoid arthritis, but he suggests other causes.

Nilsson's series of polyarthritics includes 27 cases of rheumatic fever, though he does not name the diagnostic criteria and there is no mention of an associated carditis. His differentiation between rheumatic fever and rheumatoid arthritis is not so precise as in this country; and, like many other Continental workers, he finds that the two conditions overlap considerably. His studies of the bone-marrow show that with the disease at the peak of activity there is an increase of immature erythroblasts, while in the recovery phase mature erythroblasts predominate. These observations are confirmed by serial reticulocyte-counts; at the peak of activity the reticulocytes remain low, but coincident with, or immediately before, a rise in hæmoglobin there is slight reticulocytosis.

The serum-iron, as with chronic sepsis,[5] is considerably reduced; and in peroral iron-loading experiments with 0·5 g. of iron lactate, the level rises less than in normals. Intravenous iron-loading experiments with injection of 10 mg. of iron and ammonium citrate also show an abnormally rapid disappearance of serum-iron. These findings suggest that iron is stored more rapidly in rheumatoid arthritics than in normal subjects. The possibility that defective absorption from the gastro-intestinal tract causes the low serum-iron and the abnormal result of peroral iron-loading experiments, is to some extent ruled out by the abnormal findings in intravenous iron-loading experiments. However, achylia has been described in rheumatoid arthritis, and impaired iron absorption has been demonstrated experimentally in dogs with turpentine abscesses by following radioactive iron after ingestion [6]; moreover, in such animals the storage of iron in liver and spleen is increased.[7] Nilsson has also found that in rheumatoid arthritis iron therapy has no effect on peroral iron-loading tests or on the hæmoglobin, red blood-cell count, colour-index, mean cell diameter, or reticulocyte-count. It has been known for some time that iron is bound by proteins in the serum—an action for which the B_1 globulin fraction is almost completely responsible. Cartwright and Wintrobe [8] have shown that in chronic infections the iron-binding capacity of serum is diminished. They have, however, also shown, by giving iron-binding protein intravenously, that this is not the cause of the low serum-iron. Moreover, they found no correlation between the lowered iron-binding capacity of serum and the level of the serum-iron; and thus they suggest that factors other than reduction of iron-binding globulin are responsible for the hypoferræmia of chronic sepsis.

Nilsson concludes from his survey that anæmia in rheumatoid arthritis is probably due to impaired bone-marrow activity and defective hæmoglobin synthesis, but he does not discard the possibility that increased blood destruction may play a part. It should not be forgotten, however, that Mollison [9] found that in patients with anæmia from chronic sepsis the survival of transfused red cells was no shorter than normal.

RADIOTHERAPY

AN Inquiry into the extent to which Cancer Patients in Great Britain receive Radiotherapy [10] has been made by Dr. Margaret Tod, who was acting secretary of the Radium Commission at its dissolution last year. She estimates that new cases of cancer in England, Scotland, and Wales in 1946 (population 46,560,500) numbered about 98,000, of which about 30,000 were treated in radiotherapy centres. These 30,000, she believes, were 77% of the cases needing radiotherapy: probably most cases of accessible cancer now receive treatment, but its quality requires improvement, and too few patients have palliation. She favours the commission's policy of centralising radiotherapy in large centres.

THE JENNER BICENTENARY

ON May 17 the Royal College of Physicians and the Royal College of Surgeons are commemorating the 200th anniversary of the birth of Edward Jenner. During the afternoon at the Royal College of Surgeons Sir Edward Mellanby, F.R.S., will deliver a commemorative lecture entitled Jenner and his Impact on Medical Science. In the evening there will be a reception at the Royal College of Physicians. Admission to both these functions is by invitation only.

The MEDICAL REGISTER, which had become too cumbersome for easy handling, now appears in two volumes: part 1 containing surnames A–L; and part 2 M–Z, Commonwealth list, and foreign list. The register as a whole contains 76,292 names of doctors. The number of newly registered names was 3968 in 1948, compared with 2787 in 1947 and 3556 (the highest previous number) in 1942. The Commonwealth list totals 6081, and the foreign list 1803. England and Wales account for almost half the names.

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10. Altrincham: John Sherratt & Son. Pp. 48. *3s. 6d.*

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Special Articles

PSYCHIATRIC BEDS IN A GENERAL WARD

A YEAR'S EXPERIENCE

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VERY many patients who would formerly have been treated only by physicians are now recognised as requiring psychological examination, and possibly psychiatry. Gayle (1943), for example, states that 12–20% of all patients admitted to a general hospital are primarily neurotic or psychotic. He quotes Hammon as saying that no physical basis was found for the complaints of 60% of his patients. From the point of view of inpatient treatment, the difficulty has always been that mental patients have had to go to a mental hospital or something like it, with all that this implies in the way of segregation from the community and a sense of fundamental difference from other types of illness. Not unnaturally many patients have refused treatment of this kind, and they and their relations have resented the implied stigma of psychosis or insanity.

In consequence there has of recent years been an increasing clamour for psychiatric beds in general hospitals, and there have been various supporters and opponents of this proposition. Most of those in favour have thought that a separate ward or block would be required for patients needing psychiatry (Sands 1943, Gayle 1943, Cobb 1946, Gates and Cohen 1947). This is doubtless true if the psychiatric unit is to take all or nearly all types of mental illness.

In 1947 the Withington Hospital decided to appoint a visiting psychiatrist and to allot him about 12 beds. The beds for each sex are in a general medical ward of 32 beds. They have no special situation in the ward, the remaining beds being occupied by ordinary medical cases. It was decided to see what could be done and how useful a service could be provided under these conditions. We report here on our first year's working.

By admitting patients to a general ward, they are encouraged to seek treatment earlier than they would otherwise do, and doctors are sending many patients soon after the onset of symptoms. At this stage the response to treatment is more likely to be favourable, the duration of the illness being shortened, and the tendency to chronicity minimised.

Rehabilitation both socially and economically is greatly helped by this policy, especially as in many cases only the patient's relatives and the doctors and nurses are aware of the nature of his illness.

It was proposed at first to allot to the psychiatrist the part-time services of a house-physician. However, the deputy medical superintendent decided to undertake this work—an important decision because one of the conclusions we have reached is that it would be impossible to provide an efficient unity without the services either of someone trained in psychiatry or, at any rate, of someone well trained in general medicine and interested in the psychiatric aspects of illness.

The psychiatrist visits for two sessions a week of about 2–2½ hours each. One of these sessions is devoted to outpatient consultations. These are all made by appointment, and a maximum of four new cases and three or four old ones is seen per session. The appointments are not made direct with the psychiatric outpatient clinic, but the patient must first come through the hands of a physician, who is asked to refer him to the psychiatrist after a physical overhaul. The main object of this provision is to prevent the psychiatrist from being swamped with requests to interview unsuitable cases and to make certain that the patient has been physically overhauled before the psychiatric interview, thus saving the time necessary to do this. Outpatient cases are seen by us both. Cases are also seen in the wards at the request of other members of the consulting staff.

Up to now we have been handicapped by the lack of a psychiatric social worker; but an appointment has been approved, and we hope that before long we shall have one. Meanwhile the hospital almoners have given us valuable assistance.

POLICY

It was immediately evident that only certain types of cases could be admitted to psychiatric beds. Anything "psychotic" in the sense used by Lewis (1946)—i.e., unfit to be managed at home in an emergency—was excluded. This ruled out anyone who was noisy, aggressive, demented, faulty in habits, or garrulously delusional. It seemed that cases of affective disorder, particularly of depressive type, and cases of psychoneurosis, would be most suitable for admission. A limited number of cases could be taken for observation, provided that, if they proved in any way unsuitable for a general ward, rapid disposal to a proper mental observation ward was practicable.

The essence of policy was that no patient should get into the wards without previously being seen by one of us and his suitability for admission being estimated.

Policy was also largely determined by the treatment available. Psychotherapy, except the most superficial, was obviously impracticable with the staff and time available. That is to say, broadly, psychotherapy was necessarily confined to that of kindly interest, reassurance, and the discussion of obvious difficulties.

The treatment most readily to hand and most practicable was electrical convulsant therapy (E.C.T.) given with a portable machine. Besides this, treatment with sedatives, including prolonged narcosis and modified insulin therapy, as described by Sargant and Slater (1946), was also practicable.

The nurses were not psychiatrically trained. It was therefore important to select cases carefully and to produce results so as to stimulate interest, which at first was frankly sceptical and even potentially hostile towards the scheme. The nurses, in fact, were to a very large extent frightened and rather intolerant of mental patients through lack of experience. It was striking to see their change of attitude after a few depressives had responded brilliantly to E.C.T. In the early days of the scheme they were anxious to get every attempted suicide out of the hospital and into a mental observation ward. After two or three months' experience they were prepared to go to great lengths to nurse such a patient and keep him in the ward until treatment had had a chance of producing a result.

We felt it was important to start treatment as quickly as possible, to avoid apprehension and a bad effect on morale in general. Patients considered suitable for E.C.T. were usually given their first treatment on the day of admission. Occupational therapy was given as soon as patients could coöperate. So far we have only had a part-time therapist, but we hope to expand this treatment in the near future.

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MATERIAL

The following table shows the main diagnoses of the patients admitted:

	No. of cases
Affective disorder (depressive type):	
Simple endogenous depression	50
Agitated depression	22
Recurrent depression	20
Involutional depression	11
Reactive depression	7
Total affective disorders	110
Psychoneurosis	10
Schizophrenia	2
Schizoid attack	3
Psychopathic personality	3
Organic psychosis:	
Senile and presenile	6
Cerebral tumour	1
Cerebral venous thrombosis	1
Anorexia nervosa	2
Hyperparathyroidism	1
Postconcussional syndrome	1
Dipsomania	1
Total	141

Many of the cases of affective disorder presented extensively under an organic label. The presence of the important underlying mental illness was only revealed by psychological examination. Two patients had asthma; several patients had dyspepsia, effort syndrome, and skin rashes; one patient had severe rheumatoid arthritis. The major symptom in two women was syphilophobia. One woman, admitted as an attempted suicide by drowning, had advanced parkinsonism.

Seventeen patients were admitted after attempts at suicide by various methods, the largest group being six cases of barbiturate poisoning.

The sex-distribution of the cases was:

	No. of cases	*Affective disorder*	*Other diseases*
Men	39	24	15
Women	102	86	16
Total	141	110	31

The age-distribution was:

	Youngest	*Oldest*	*Average all cases*	*Average E.C.T. cases*
Males	15	74	42	40
Females	15	74	42	42

The source of admission was:

Seen in private	32
From outpatient clinic	29
From clinics of other hospitals	26
Transfer by inpatient consultation	21
Direct admission from general practitioners	20
Casualty department	13
Total	141

TREATMENT

In this scheme the sheet anchor of treatment is E.C.T. Treatment is given twice a week to suitable cases. To allay apprehension every patient is given 'Sodium amytal' gr. 3 an hour before treatment. He is then wheeled out of the ward into an adjoining room, given a convulsion, and wheeled back during the postconvulsive phase of coma. So long as stertorous breathing has stopped, and any postconvulsive restlessness has subsided, other patients in the ward are not upset. On an average eight convulsions constitute a course, involving a stay of about four weeks in hospital. In addition many patients, especially neurotics, benefit enormously from a period of removal from home, with rest, discussion of problems, and the judicious use of sedatives.

RESULTS

The results of treatment in affective disorders, so far as regards psychiatry, are shown in the accompanying table. A follow-up questionary is sent to each patient two months after a course of E.C.T., and if his reply is not satisfactory he is asked to attend for interview at the outpatient clinic. Results have been tabulated entirely on the patient's own assessment. It is interesting that the patients who did not reply to the questionary were either of low intelligence or had previously attempted suicide.

Of those patients with affective disorder who completed treatment 68 (69%) described themselves as recovered or improved.

These results do not on the whole appear quite so good as those of some other workers. Osgood (1942), for example, found 94% of his patients to be recovered or improved, and Furst and Stouffer (1941) 89%. We think the discrepancy can be explained by the fact that our results are based entirely upon the patient's subjective assessment. In mental cases, especially those with a strong neurotic element, it is well known that patients are extremely hesitant about expressing themselves as better. We have felt with many cases that our assessment would be better than theirs, but have left it as it was, having decided to use the patient's assessment as a basis.

RESULTS OF E.C.T. IN AFFECTIVE DISORDER (2 MONTHS FOLLOW-UP)

—	No. of cases	Recovered	Improved	No change	No reply	Course not completed
Men	24	5	10	5	2	2
Women	82	15	38	12	11	6
Total	106	20	48	17	13	8

Many of those depressives who did not respond satisfactorily to E.C.T. had been diagnosed from the start as having a concomitant psychoneurosis (4 men and 36 women) or psychopathic personality (5 women). A good result in these cases was hoped for but not confidently expected.

In addition to the psychosomatic disorders already mentioned, E.C.T. was given to several patients with osteo-arthritis of the spine, a patient with a severe kyphosis resulting from an old spinal caries, and a very advanced case of rheumatoid arthritis, without any ill effects.

Patients with osteo-arthritic changes tended to complain of pain in the back, but this was seldom severe, and X rays, which were always used when the patient complained, did not show any fracture. Including a few patients treated as outpatients, over 1000 E.C.T. were given without fractures, dislocations, or other untoward complications.

Many patients had hypertension, ranging from mild to severe (230/140). This was not regarded as a contra-indication and gave rise to no trouble of any kind. Several patients had chronic bronchitis or bronchiectasis. Four patients died before the follow-up—from coronary thrombosis, myocardial degeneration, carcinoma of the lung, and peritonitis.

Two of the best temporary results were in men with anorexia nervosa. The first of these also had a severe bronchiectasis. His anorexia was cured by E.C.T. and his weight increased; he still had numerous psychoneurotic symptoms. The second man died from staphylococcal peritonitis due to pyæmia resulting from protracted malnutrition several weeks after completing E.C.T. His appetite remained good until a few days before his death.

DISCUSSION AND COMMENTS

Certain difficulties arose. Occasionally an unsuitable case got through the filter—we have found ourselves

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faced with the urgent problem of a paranoid schizophrenic in an aggressive mood. Management was by the immediate use of massive doses of sedatives and removal to a mental observation ward—not always an easy task in these days. Incidentally we found that many patients admitted to the ward with severe physical illnesses and an accompanying toxic delirium were more troublesome and caused more disturbance than did any of the mental patients. Complaints about the behaviour of mental patients have not been frequent.

Then there were the inevitable chronic grumblers who occur in every mental group and have a remarkable facility for infecting other patients with their trends. Often one of these chronic hysterics or hypochondriacs would get into the ward under the guise of a depression. Immediately after E.C.T. this patient complained bitterly of various sensations, insisted on talking at large about them, and generally had a bad effect on the group as a whole. The technique of dealing with such a patient was to discharge him as soon as was reasonably practicable, and to attempt to avoid a recurrence by even more careful selection of cases.

Our patients were an average cross-section from all aspects—social, economic, and so on—of the general patients in the hospital. Though the general patients in the ward knew that their neighbours were under the care of the psychiatrist, the relationship of non-mental to mental patients was friendly and natural. The mental patients, being able to get about more, tended to group together, but this was not due to any antipathy between the two types of patients.

Patients starting treatment were helped by various group factors. Those who were recovering or had recovered encouraged them greatly. The proximity of patients with severe physical illnesses strengthened their morale. As one patient said: "When I look at all these sick people it takes my mind off myself."

We believe that the provision of a service of this type for the hospital class of patient fulfils a real and increasing need. We have received many expressions of gratitude from our patients and their relatives for the fact that they were treated as normal people in a general ward, completely escaping the stigma unfortunately still associated with a mental hospital or even with a mental ward. The following extract from a recovered patient's follow-up letter illustrates this more clearly than any amount of explanation:

"My gratitude is very deep for the understanding thought in the treatment which mixes the mental cases with other complaints such as pneumonia, asthma, ordinary operations, &c., thereby taking away the stigma and sadness a mental patient usually feels."

We want to expand this work and believe it could with advantage be adopted elsewhere. It renders a real and valuable service to the hospital class of patient and, as we have tried to show, if one limits oneself to reasonable objectives, it is not difficult to organise and run.

Our thanks are due to Dr. J. M. Greenwood, medical superintendent, Withington Hospital, to the physicians whose wards we shared, and to the sisters and nurses for their help and coöperation.

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THE BATTLE OF THE BOTTLE

FROM OUR AUSTRALIAN CORRESPONDENT

THE deadlock continues between the Australian government and the B.M.A. over "free" medicine and the National Health Services Bill.

The latest government move is an amendment to the Pharmaceutical Benefits Act, passed last month. This amendment makes it an offence (fine £50) for a doctor to order any prescription or any drug in a prescription contained in the official formulary, on other than an official prescription form. The amendment will not be proclaimed for another two months, to give an opportunity for doctors to "reconsider their attitude." There is certain to be a test case over this amendment, and the B.M.A. is prepared to take it through to the Privy Council if necessary. The B.M.A.'s legal advisers have given their opinion that the Pharmaceutical Benefits Act is invalid. In reply, Mr. Chifley, the prime minister, stated that amendments would be made to the Act to make certain that it was constitutionally sound and that regulations could be issued.

The B.M.A. case probably will be built up largely on the point that when the federal government in 1946 obtained by referendum the constitutional authority to legislate for national medical and dental services, the new Commonwealth power was limited by a proviso excluding any form of civil conscription. Doctors regard the new compulsory legislation as a form of civil conscription. Two years ago Senator McKenna, the federal health minister, said that there would be no conscription of doctors.

Meanwhile, the government is revising the formulary upon which doctors' prescriptions have to be based under the free-medicine scheme. The B.M.A. has refused to sit on the committee which is revising the formulary.

The whole fight between the government and the doctors now centres on the formulary and the free-medicine forms. Although the government has spearheaded its attack with the free-medicine forms, doctors actually do not regard this as the major issue. They say that, if more important principles are settled, there should be some way to agree on the formulary.

These are the issues on which the B.M.A. is standing:

Doctors object to being brought under the control of a government department—the federal health department. They want control by a body mainly of medical men; they do not want to be civil servants.

The doctors wish to retain their doctor-patient relationship. If the government want to pay the patients' fees, it can do so—say by refund through the post office or some other agency.

Doctors object to the proposal that they should keep records and secure a government cheque monthly for a proportion of patients' fees. They do not want to be forced to show to some government official their patients' records, which check the government is insisting on.

These objections cover the wider aspect of the government's proposed free medical services. But doctors feel that, if they give in on free medicine they might be forced a step further into the whole medical plan.

It was thought at one time that the government might persuade union members to insist on a free-medicine prescription from their doctors, might swamp the country with refugee doctors from Europe, and might push through rehabilitation doctors to become "nationalised" doctors. Emergency measures which would have been considered by doctors would have included refusing to teach at any Australian medical schools; carrying out only emergency and urgent work at public hospitals; and refusing to give certificates in the many industrial cases requiring a "bill of good health."

Few doctors have wanted to see the dispute degenerate into a free-for-all brawl, but many B.M.A. members

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feel that there should be no question of sacrificing ethical principles to what they consider is a badly conceived and badly planned national health scheme.

In the meantime Australian public opinion has been rather scared away from "free" doctoring by the recent British Budget.

B.M.A. ATTITUDE

This is the official attitude taken by the federal council of the B.M.A. at its meeting last March :

That the essential points of any National Health Service are : (1) that payment be by the refund system exclusively, (2) that there should be a scale of benefits and not a scale of fees, and (3) that there be no experimental health centres as envisaged by the minister for health under the National Health Service Act, 1948.

In the event of these three points not being met by the government and a form of control becoming unavoidable, then the following form of control should be advocated :

1. That, under the minister and at a level with the director-general of health, there shall be a controlling body, predominantly medical and representative of the practising profession. Its function will be the control of all the professional aspects of the National Health Service.

2. That no regulations under the National Health Service Act be promulgated without first being approved by the controlling body.

3. That the department of health shall have no function under the National Health Service Act, other than the implementation of policy arrived at by the controlling body.

4. That medical members of the controlling body shall be employed part-time and paid on a sessional basis.

5. That medical representatives of the practising profession on the controlling body shall be the direct nominees of the medical profession.

6. That the representatives of the practising profession shall be appointed for a period of three years and be eligible for re-nomination.

HISTORY OF THE STRUGGLE

Here is a summary of the steps which led to the present position :

Dec. 8, 1947.—The government announces that the free-medicine scheme will be brought into operation early in 1948.

April 22, 1948.—B.M.A. objects to scheme, continuing its criticism of previous months. Discussion held between B.M.A. federal council and health minister. Federated Pharmaceutical Guild announces its readiness to support scheme, on terms arranged with the government.

May 2.—Senator McKenna announces in national broadcast that the free-medicine scheme will operate from June 1. He explains : "No doctor will be compelled to coöperate," "gravely regretting" that the government is unable to meet the B.M.A. council on all points.

May 10.—A special gazette (88-page document) issued by the health minister gives procedure to be adopted under the scheme, details of the formulary of about 600 items, and penalties for doctors, hospitals, and chemists for breaches under the Act.

May 18.—B.M.A. circular urges all members to prescribe after June 1 as they have been doing previously, and not to use government free-medicine and formulary forms.

May 20.—B.M.A. president (Sir Henry Newland) makes last-minute plea to Canberra with final basis for coöperation with the government. New South Wales Trades and Labour Council describes doctors' attitude as a "vicious strike." The health minister says there are no grounds for re-submitting the matter to the cabinet.

June 1.—Scheme comes into operation (prescription forms having been sent and returned by doctors). Notices "Approved Chemist" appear in chemists' shop-windows. B.M.A. says its offer to coöperate under terms it considers fair and reasonable still stands.

June to December.—Deadlock deepens with stiffening attitude on both sides.

Feb. 9, 1949.—Government announces 121,000 free-medicine prescriptions written by doctors for six months ending December. (Those not free would run into millions.)

Feb. 22.—Mr. Chifley says : "If a scrap cannot be avoided, then we must scrap and if necessary let the people vote on the issue."

March 17.—The government passes an amendment to the Pharmaceutical Bill, compelling doctors to write prescriptions on a free-medicine form.

April 9.—Proclamation of this amendment held up while government revises formulary.

SOCIALIST MEDICAL ASSOCIATION

THE 19th annual meeting of this association was held in London on May 7 and 8 with Mr. SOMERVILLE HASTINGS, the president, in the chair.

Dr. IAN GILLILAND presented a policy statement drawn up by the executive committee. This declares that the association should now campaign for a health service based entirely on Socialist principles. Control should be democratic at all levels. It asserts that the maximum number of patients on a general practitioner's list should be reduced, and that teaching hospitals should be brought under the control of the regional hospital boards. There should be a full-time salaried service for all health workers, and Whitley Council machinery should be used for determining the pay and conditions of all grades. In developing the service the provision of health centres is said to be of cardinal importance, and a further objective should be the nationalisation of the drug industry and the control of patent medicines. Emphasis should be laid on preventive services, in which an industrial health service would play a large part. Finally, the statement foreshadows a programme for the promotion of good health.

Subsequent speakers complained that the hospital boards and boards of governors were undemocratic in their composition and operation. Dr. RICHARD DOLL pointed out that, though the infant-mortality rate had greatly improved, the relative differences in the rates for the highest and lowest income-levels had not diminished in the last ten years.

The statement was accepted as the future policy of the association.

Dr. HORACE JOULES moved a resolution which regretted the cuts in hospital budgets and pointed out that these might result in lower standards of treatment and in the closing of hospital beds. In passing this resolution, members strongly urged the Minister of Health to modify his policy. A further resolution drew attention to the effect that the cuts were already having on the training of specialists ; a number of trainees had already had their appointments terminated, and if this went on there would soon not be enough specialists to man the service.

In a discussion on health centres it was agreed that these were needed more urgently than ever. The meeting decided to support the setting up of temporary centres as an emergency measure.

Dr. A. G. SIGNY regretted that the terms offered by the Minister were more favourable to part-time than to full-time specialists.

Another resolution called for the payment to student nurses of a minimum wage of £5 a week, with a working week not exceeding 44 hours and payment for overtime. While passing this, the association maintained that the proper status of a student nurse was that of a student, living the life of a student.

Dr. L. T. Hilliard has retired from the treasurership, though he will remain on the executive committee of the association. The officers for 1949–50 are : president, Mr. Somerville Hastings, F.R.C.S., M.P. ; vice-presidents, Dr. H. H. Joules and Dr. D. Stark Murray ; hon. secretary, Dr. E. Bunbury ; and hon. treasurer, Mr. H. H. Barst, F.R.C.S.

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In England Now

A Running Commentary by Peripatetic Correspondents

THIS surgical ward has not changed much in the 20 years since I was a house-officer here. There are the same fractured femurs set up in the identical Balkan frames, and the same huddle of convalescents round the fireplace, though a single gas-fire has replaced the two blazing coal ones, so the huddle is thicker. It is also thicker because of the cult of early rising; whereas 20 years ago only a sprinkling of the patients were up and about, now only a sprinkling are confined to bed. But what shook me when I was admitted was the sight of men sitting up in bed, or round the fire, brazenly smoking; not that our patients usen't to smoke, but they did it surreptitiously in the bathroom, ready to palm their cigarettes and look innocent if Sister came in.

On operating days one is soon struck by that marvel of modern anæsthesia—the disappearance of the kidney-dish. No longer is the ward made hideous by the retchings, coughs, and spittings of patients "coming round." A few still cry out deliriously, or burst into raucous song, but most regain consciousness with dignity, neither feeling nor looking as if they were recovering from a debauch.

Nevertheless, it is to the immediate postoperative period that I would draw the experts' attention. The old stagers spoke truth when they told me there was nothing to be afraid of "downstairs." To anyone who can recall the horrors of an open C and E induction (and that means everyone who ever had one) thiopentone and its rivals are an unbelievable advance. "You feel the doctor's needle go in," they said, "but you're in dreamland before he takes it out. There's nothing to it." Having noted the absence of vomiting, &c., aforesaid, I wondered why they added: "It's the afterwards that's not so good," but now I know. So completely and rapidly do these newer anæsthetics wear off that within 3–4 hours of returning from the theatre one can fully appreciate what the surgeon has been doing to one's abdominal (or other) wall. By midnight, when each of my Michel's clips was aching like a class A toothache, I even wished myself back in the bad old days, when I would still have been semiconscious and too occupied with extruding my ether vapour to care about my wound. Morphine brought temporary relief; but for two nights and days there were long periods when I suffered severely. When I watched the other patients closely and questioned them judiciously I found that nearly all of them had a lot more pain than they made out to Sister or the H.S. The traditional answer to the question "How are you getting on?" is "Fine, thanks"; and the busy house-officer is apt to leave it at that. I fancy that specific inquiries concerning pain in the wound would often produce a very different reply.

From my small experience I would say that the art of postoperative analgesia has hardly advanced at all in the past 20 years. Isn't it yet practicable to keep operation wounds nicely numb for the first 48 hours or so?

* * *

Old Joe Honeysuckle came to me in much distress the other day because the sparrows had torn our yellow crocuses to shreds. "Drat them spugs," he said, "and that bain't the only trouble; the wind have gone and snapped nearly all them daffydillies in the front border, and half the hyacints have growed lying down flat. I wonder you scientists don't do something about it. You call this the plastic age. Then why don't some of you invent plastic flowers? It'd save me a mint of trouble, and you wouldn't get spugs nibbling your crocuses, or the wind destroying your daffydillies, or the hyacints growing sidewise. And look at the colours you'd get. Why, there'd be nothing to stop you having blue daffs and spotted and striped crocuses." "We'd even put Dumas' black tulip in the shade," I suggested, somewhat foolishly because it was over his head. "I don't think much of black for a tulip," he grunted, "but you can put it in the shade if you think the sun will make the coloured plastic fade. You could leave the plants in till you got tired of 'em and put in a new kind. And you needn't stick to seasons; you could have roses in January and snowdrops in July. And you needn't stick to nature; you could invent blooms to your own fancy—but I'll be blowed if I know what names we'll give 'em. Flowers, plastic or not, should all have monickers." "I know," I said, "I'll call my plastic sweet pea *Diabetes mellitus*"—but that remark also was over Joe's head.

* * *

Whenever I want to increase my knowledge of a subject, I set it as an examination question. The result is a cross-section of the world of medicine from which by study and selection one ought to be confident of acquiring an accurate impression of current opinion. So I asked about chronic alcoholism, with the idea of exploring the various sources of instruction, the experiences, and even the misconceptions, and establishing once and for all the truth of the zooscopy which is the conventional accompaniment of delirium tremens. But perhaps that was asking too much. What chance has the present-day practitioner or student of observing delirium tremens at first hand? So only the stereotyped textbook descriptions were forthcoming. Those who played for safety referred to "terrifying hallucinations" without further particularity. The popular selection was "pink elephants." A notable exception was a Burmese candidate whose alcoholic patients in their delirium encountered tigers. And that set me thinking. Is there in this phenomenon a geographical-zoological association? Of course, were this so the pink elephants would have to be eliminated so far as this country is concerned, to be replaced by the more commonplace but comprehensible rodents. Then if the over-indulgent Burman sees tigers, we should expect the Australian to see kangaroos, the Esquimaux, polar bears, and the Russian, wolves—*red* wolves. Alternatively, as familiarity breeds contempt, it may be that the animals habitually encountered provide no hallucinatory terrors for the natives, so that rats and mice are, after all, less appropriate to this country than—pink elephants.

* * *

It's nice to be a private patient and sink into a comfy chair without having to suffer the tiresome delays which irk the active mind. I check a desire to spout about my complaints, relate only the somatic section, and wait (with what eager hope!) for the physician's invitation to release my overwound psyche. Alas, I am thwarted. With relentless aplomb, he unwraps my soma. It's neat the way he gets the salient points without appearing to ignore the dross. I enjoy it and forget the chip on my shoulder. I am about to chatter with the boastful understatement of a Maugham male, then I become aware of the Eye on my twisting fingers. Do I too, look so omniscient when they come to consult me? The hypnotic transference is now complete. At the command I leap up and undress with thoughtful speed, remembering his Limited Time. I lie down to give myself up to a searching five-finger exercise and find it easy to relax on a 'Slumberland' with an electric element three feet above my umbilicus. To our combined surprise a physical sign is found. There is a pause while I think of an excuse for it and he thinks up the reason and also a better excuse than mine. As I dress, wisecracks on psychosomatic unity fly about while he writes. (The successful physician must always be able to write one thing and say another.) For the patient the last stage is always the foggiest. Supine and receptive, I can remember every significant pause in his phrases; upright, and worrying about the future, I remember nothing to help me cap the aphorism with an epigram.

Later I find myself supine on a cold hard slab with barium lying like a frozen eel in my guts. Later still my physician loads me with irksome somatic restrictions without (bless his heart) much enthusiasm. These are presumably to redress the imbalance caused by the overloading on my psyche. It is not without significance that I must adjust my soma to the three-hourly assimilation of milk from a bottle. It had evidently not escaped his notice that my psyche was behaving as if it too wanted to regress to the infantile. I agree with one of my patients who said, "I'm sure he sees right through you."

Yes, thank you. I'm feeling better already.

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Letters to the Editor

IS ENGLAND THE CHINA OF THE WEST?

SIR,—A distinguished Norwegian doctor said to me once: "We love your country, but it is the China of the West—so backward."

Certainly if we are as backward all along the line as we are in the limited field of tuberculosis, the commiseration of our neighbours is well deserved. In 1910 we lagged in the collapse treatment of pulmonary tuberculosis by years, and in 1949 the lag with regard to B.C.G. vaccination can be measured in decades. Why? Had artificial pneumothorax treatment been introduced by Sir Robert Philip instead of by Forlanini, and had B.C.G. vaccination been introduced by Sir Almroth Wright instead of by Calmette, we should not have been caught napping.

That shrewd observer of medical affairs, the late Dr. J. T. Conner, in turn editor of the *Medical Review* and the *Clinical Journal*, used to warn his contributors: "Remember when reporting discoveries from foreign sources that the English general practitioner accepts new teachings only from English consultants." Unfortunately the busy English consultant does not always have the time, the linguistic education, or the local orientation needed for a competent investigation of all the new ideas in circulation abroad. Most of them, he suspects, are sure to be duds, and the rest can wait. As if anything really good can wait! Besides, with a reputation to lose, he must never be caught out barking up the wrong tree. So, instead of barking, he just sniffs. As if mere sniffing led anyone anywhere! Considering the circumstances, is he much to blame for his parochial mentality? Is he not just the helpless victim of his environment? How are we to deal with him? On this side of the Iron Curtain a certain old-fashioned fastidiousness may force us to draw the line at liquidation, but can we not circumvent him gently, more in sorrow than in anger? I think we can, gradually, and this is why I am writing this letter.

Let us catch the English consultant in embryo, just after he has qualified as a doctor, and make it worth his while to study abroad. It may, perhaps, seem futile in these poverty-stricken times to seek for some medical benefactor who will do for young English doctors what Mr. Somerset Maugham has begun to do for young English authors. But let me quote Miss A. L. Barker, the winner of the first award under the Somerset Maugham trust:

"The object of the Somerset Maugham award is, briefly, to enable young writers to enrich their writing by experience of foreign countries. Somerset Maugham, himself widely travelled, believes that it is in this tying to the native apron string that the fault chiefly lies. A certain insularity, too close an occupation with home affairs, home opinions, home people—is this the reason for fewer translations and the rare success of an English book abroad?"

Another measure, with the same object and costing nothing, would be the award of degrees and diplomas by our universities and examining bodies to young doctors who have mastered at least one foreign language, and who have studied for a given time at specified foreign centres of learning. A year with a man of Leriche stature and with a French dictionary, or a year with an Arvid Wallgren and a Swedish dictionary, would give our youngsters a wider horizon than mugging at home over examinations for the higher medical degrees.

Sunnfjord, Norway. CLAUDE LILLINGSTON.

THE MEDICAL ILLUSTRATOR

SIR,—Mr. T. B. Layton protests against Education through Terror as un-English, citing an illustration in Miss Treadgold's paper in your issue of April 23, and suggests that the medical teaching staff of Guy's Hospital are jointly responsible for the bad tone of this picture. They are not; I alone am at fault.

Not being trained at Guy's, I can say how greatly I appreciate the facilities for medical illustration provided for its teachers by the Guy's Hospital medical school. The picture cited is an example of an idea vaguely thought out in my mind and given, as Mr. Layton agrees, brilliantly vivid shape by Miss Treadgold. Whether this was a good idea I will only be able to say after I have used it in teaching and observed the medical students' reactions to it. The Black Widow was a thoroughly bad teaching aid in a public campaign, but medical students can safely be informed that pertussis has a high mortality under one year and may damage the lungs of toddlers. Miss Treadgold has put life into the following table [1] which to Mr. Layton's informed mind is just as terrifying as her picture:

Age	*Case fatality per 100*
0–1 years	8·8
0–5 ,,	3·0
5 and over	0·5

This picture was designed not for the public advertisement hoardings but for medical students. THE LANCET has many lay readers; but you, Sir, will not, I hope, get into trouble with the Director of Public Prosecutions or with Mr. Layton because another of the illustrations to Miss Treadgold's article lists methods of procuring abortion.

The second of Mr. Layton's complaints I do not understand. Mr. Layton is a great teacher, and the effect of his teaching continues in any whom he taught, but I am sure that he will agree that each of us should be allowed to teach as we think best. He will be glad to know that I have not been asked to submit the teaching aids I use to any committee.

Guy's Hospital, S.E.1. RONALD MAC KEITH.

STREPTOMYCIN IN NON-TUBERCULOUS INFECTIONS

SIR,—Dr. Buxton and his colleagues state, in their article of April 30, that 4 ml. of solvent was added to 1 g. of streptomycin to produce a 1 in 4 (25%) solution. It would appear that the volume occupied by the streptomycin itself has been ignored. This introduces a very considerable error since the drug, in solution, may occupy as much as 1 ml. per g. The actual volume occupied varies with the particular sample of streptomycin salt used, but it is usually between 0·5 ml. and 1·0 ml. per g.

If the whole of the solution is to be used at one injection, this is of little significance; but if fractional doses are to be given, a correction must be made. In the example quoted it would seem that the patients with urinary infections received, in four days, an amount of streptomycin of the order of 10 g. rather than 12 g.

Royal Manchester Children's Hospital — DENNIS F. SMITH, Chief Pharmacist.

GLASSES OFF THE PEG

SIR,—I read with considerable dismay the suggestion in your annotation of April 30 that, in view of the present delay in the supply of spectacles, a man could do worse than follow your peripatetic correspondent's lead and choose his glasses on the trial-and-error method at a chain-store. I should like to support Mr. Black's comments in your last issue.

It seems to me that your annotation takes no account of the many important factors which render such a procedure at the worst dangerous and at the best ill-advised. It is quite possible for ocular disease to go undetected, and for the "patient" to be lulled into a false sense of security by the feeling that he has attended to his visual needs. In incipient glaucoma, for instance, one of the signs may be the need for stronger and stronger reading-glasses.[2] Apart from this, however, it is a fact that most people, if left to their own devices, choose lenses that are stronger than is really necessary, while the number of prescriptions which are the same in both eyes is a small proportion of the whole.

Leaving out the quality, the majority of lenses provided in chain-stores are convex spherical and therefore useless in myopia and astigmatism.

A further most important point is the fitting of the frame. A frame that is badly fitting—which most self-chosen ones will be—may have an appreciable effect on the oculomotor balance of the eyes. With a prescription of R. and L. + 5 D. for instance, the effect of the frame being 5 mm. too wide (everybody likes large eyes these

1. Butler, W. *Proc. R. Soc. Med.* 1947, **40**, 389.
2. See Parsons, J. H., Duke-Elder, S. Diseases of the Eye. London, 1948; p. 287.

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days) is to introduce 5Δ prism base-out, with at the least discomfort, but more often diplopia.

I think that conclusive evidence that the public have not found any lasting satisfaction from chain-store spectacles is to be found in the gratitude and surprise of the innumerable old persons who previously could only afford to buy their glasses in that way and since July 5 have had their eyes examined and the right correction prescribed under the National Health Service. Most opticians have on their records many such cases.

As for the assertion that lenses have no curative value, this is obviously not so, for if it were a great many squints would never be cured.

Finally I would say that a doctor would do better to find a friendly optician who, knowing his real optical needs, might be able to lend him a frame glazed with lenses sufficiently near his prescription to enable him to carry on without the hit-or-miss probabilities associated with chain-store spectacles. This would at least tide him over satisfactorily until he could obtain his correctly prescribed glasses.

G. H. GILES
65, Brook Street, London, W.1. Secretary and Director of Examinations, British Optical Association.

GYNÆCOMASTIA WITH AMPHETAMINE THERAPY

SIR,—Cases similar to those described on April 16 by Dr. Tooley and Dr. Lack were seen by us when using amphetamine in the treatment of obesity.

During the first seven months of 1948 we observed gynæcomastia, menorrhagia, and postmenopausal bleeding following amphetamine therapy. In one man gynæcomastia was associated with impotence, in another with oligospermia (3,000,000 spermatozoa per ml.). Endometrial biopsy on a woman with postmenopausal bleeding, whose periods had ceased 15 years previously, showed a hyperplastic œstrinised endometrium. All these disturbances ceased when amphetamine was stopped. No new cases with these complications were seen after July, 1948, and further administration of amphetamine to patients previously affected did not provoke recurrence of endocrine disturbance. The batches of amphetamine which caused these apparently œstrogenic effects were the same as those used by Dr. Tooley and Dr. Lack. A few cases were observed at the same time in another hospital, supplied with amphetamine by the same manufacturers.

In view of these clinical observations, it seemed interesting to investigate the œstrogenic potency of amphetamine in ovarectomised rats. Unfortunately the preparation used was not identical with that used in the cases noted above, for at that time we had not realised that the effect was confined to certain batches of amphetamine. Rats were ovarectomised at 21 days and injected subcutaneously twice daily with an aqueous solution of amphetamine over a period of two months. The total dose injected during this time was 50 mg. per rat. The injected animals showed no œstrogenic stimulation as indicated by uterus-weight and histology when compared with controls injected over a similar period with physiological saline. It seems therefore reasonable to conclude that the œstrogenic substance present in the earlier batches of amphetamine was an impurity confined to that preparation only.

A. STUART MASON
PEGGY MORRIS.
London Hospital, E.1.

SENIOR HOSPITAL MEDICAL OFFICERS

SIR,—Your issue of May 7 contains in the advertisement columns an item quite as meaningful as your leading article on Senior Hospital Medical Officers. The appointment is for an "Assistant Physician (Psychiatric)" at the Cassel Hospital:

"special interest and experience in the neuroses is desirable, in addition to a knowledge of general psychiatry, and candidates should possess the D.P.M. . . . The future designation of the post is likely to be that of Senior Hospital Medical Officer."

What in that case is to be a psychiatric specialist? Can the mortals who run the psychiatric services entertain even the thinnest prospects of ever becoming one? Presumably, we must all look forward to a lifetime of being, as you put it so nicely, "content to do specialised work of a routine kind, without claiming either the full privileges or the final responsibilities of specialist rank," nor, as you might have added, the income of a general practitioner.

What, by the way, are these "final responsibilities" which, in the case referred to above, the doctor with the D.P.M., a general knowledge of psychiatry, and a specialised interest in the neuroses, could not be "privileged" to claim and be paid for?

Virginia Water, Surrey. H. BOURNE.

SCORPION STINGS

SIR,—It is interesting to note that Mr. Dewey's method of treating scorpion stings (*Lancet*, April 30, p. 757), by the application of rectified spirit in which scorpions have been killed, is very similar to that advised in the *Philosophical Works of the Honourable Robert Boyle* (1738), 2nd ed., edited by Dr. Peter Shaw. In vol. 3 (p. 548) he says:

"'Tis known, by daily experience, that in Italy, and other hot countries, tho' the stings of scorpions often produce very acute pains, and formidable symptoms, yet the mischief is easily remedied, either by presently crushing the body of the scorpion upon the hurt, or by anointing the part affected with oil of scorpions; which being made by suffocating those insects in common oil, and keeping it long in the sun. The liquor does not appear to have any manifest quality, to which its sanative efficacy may be ascribed."

Cambridge. LAURENCE MARTIN.

RETROPUBIC PROSTATECTOMY

SIR,—In answer to the letter of April 23 by Mr. Millin and Mr. Macalister, I would like to make it clear that, whilst there seems to be no basic disagreement between us on the indications for prostatectomy, I was making a plea for the exercise of caution. I readily agree that there are cases with little or no residual urine in the bladder but which show changes in the upper urinary tract on intravenous pyelography, but they are a small minority. Even in these cases the urine dammed back in the ureters is residual urine in the sense that it cannot be voided by micturition.

Lastly, with regard to my "epic sentence" that residual urine is the "sheet anchor" of prostatic surgery; if your correspondents will consult Fowler's *King's English* (pp. 210–218) I submit that they will agree that this cannot be called a mixed metaphor even by the strictest grammarian. It may be regarded as a poor or even an ill-chosen metaphor, but it is not a grammatical error; and by including the words in inverted commas I indicated that there can be no actual resemblance between residual urine and a sheet anchor. The latter is defined in the *Concise Oxford Dictionary* as being figuratively the "last dependence or security"; and in my submission if we neglect this we will drift rudderless upon an uncharted sea.

H. K. VERNON
St. James' Hospital, London, S.W.12. Surgeon Specialist.

PATHOLOGIE DES KOHLEHYDRATSTOFFWECHSELS

SIR,—In your issue of March 26 the review of my book says: "The treatment of the references is perhaps the weakest part of the book. Many authors are quoted by name in italics throughout the text, yet their names do not appear in the rather attenuated and unalphabetical list at the end." It is true that I dispensed with an alphabetical index of authors, because it seemed to me superfluous; but the reader can with little trouble find at the end of the book those authors and their works which appear in italics throughout the text.

The bibliography is so arranged—as I pointed out in a footnote on the first page of the bibliography—that authors and their respective works or papers appear in exactly the same sequence as in the text.

I have departed from the assumption that a reader may take especial interest in a certain chapter out of turn. In the bibliography for each chapter he will find the names of authors referred to in the text, with, I believe, a complete enumeration of all their relevant contributions. The same

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names may, however, recur elsewhere in the book when I quote their achievements in a completely different field and context. They will be found again in the bibliography under the pertinent chapter and sub-chapter heading. The chapter on Acidosis (F) affords possibly the best example of my system. It shows clearly how my bibliography has been split up into comprehensive general summaries and special references for each sub-chapter and appendix.

Thus I feel justified in maintaining that my bibliography is rich and detailed. The index of subjects may appear to have been treated somewhat summarily. I do, however, stress especially that matters already listed in the table of contents—which is obviously perused first of all—are not again repeated in the index.

I will admit that my treatment of references has not followed conventional lines, but I believe that it allows authors and their works to be located with small trouble.

II Medical Clinic,
University of Instanbul.

E. FRANK.

"THE SNAKE PIT"

SIR,—As producers and distributors of the film entitled *The Snake Pit*, we should like to reply to the letter from Dr. Cunningham Dax in your issue of April 30.

It was our intention from the outset to preface the film with an appropriate foreword, making it clear not only that the story is set against the background of a large mental hospital in America, but also that there is no intention to suggest that it represents conditions as they exist in British mental hospitals today; and we have even gone further in stating that it is our understanding that, in this country, those who are obliged to seek mental treatment are assured of every aid to recovery which science can offer them and the maximum of sympathy and understanding from doctors and nurses alike. The incorporation of an appropriate foreword was also a condition laid down by the British Board of Film Censors before agreeing to issue a certificate for this film.

We believe that this information will allay the misgivings of your correspondent, and we can assure him also that the film will not be advertised to the public in any sensational manner.

It is not for us to enter into any discussions of a psychiatric nature, but we would point out that, in agreeing to permit the exhibition of a modified version of the film in this country, the censor was aware that a responsible body of psychiatric opinion—after seeing the modified version of the film—had advocated its release, including some psychiatrists who had previously shared Dr. Cunningham Dax's misgivings after seeing the uncut version.

31, Soho Square,
London, W.1.

W. J. KUPPER
Managing Director,
Twentieth Century-Fox Film Co, Ltd.

SIR,—I recently saw the film of *The Snake Pit* in America and cannot agree with Dr. Cunningham Dax (April 30) that its showing in this country would be "deplorable."

The novel on which the film is based was, I understand, written as an indictment of mental-hospital conditions in a certain State of the U.S.A. Its showing in England will not necessarily imply that our mental hospitals are unsatisfactory or that they are conducted on the same lines as the hospital in the film. If there are features which would tend to dissuade people from seeking early treatment, they are probably less terrifying than the ideas which these potential patients already have of mental hospitals. The film clearly demonstrates the skilful handling which a young woman receives and which leads to her recovery; and it has the additional merit of indicating factors which predisposed the patient to mental breakdown.

On the basis of Dr. Cunningham Dax's objections, many films should be banned because they may distort the facts or create bad or faulty impressions. Films are essentially for entertainment but often have educational value. *The Snake Pit* is an absorbing, well-produced, and beautifully acted film of this type. It would be a pity to ban it because some ignorant person might be reluctant, after viewing it, to enter a mental hospital. In any event, how many of us have noted any eagerness on the part of our cases to become even voluntary patients?

But are mental hospital conditions so satisfactory in this country that those in the film might grossly misrepresent them? I doubt it.

London, W.1. ELLIS STUNGO.

WERTHEIM'S OPERATION

SIR,—Mr. Stallworthy's able and stimulating letter in your issue of April 23, will, I hope, give helpful encouragement to the younger generation of gynæcologists. For many years now I have invariably combined radiation and surgery wherever possible in treatment of carcinoma of the cervix, but have only given a single Stockholm dose 7–10 days before operating. This procedure combined with block dissection [1] has convinced me that all Mr. Stallworthy says about the end-results of this combined therapy is undoubtedly true. The diminution of postoperative sepsis (the complication most to be feared) and the dramatic lowering of the operative mortality prove this.

London, W.1. AUBREY GOODWIN.

SIR,—I was very interested in Mr. Stallworthy's letter in your issue of April 23.

Since 1938 I have treated all cases of operable carcinoma of the cervix either by (*a*) preliminary radiation usually with a full Stockholm course of radium, (*b*) cauterisation with a poker cautery, or (*c*) diathermy, before performing the Bonney-Wertheim hysterectomy. In selected cases I also perform, at the time of operation, a presacral neurectomy so as to reduce pain from possible visceral secondaries. I have seen few secondaries in the vault of the vagina since treating cases in this fashion. My series, like Mr. Stallworthy's, is small but most encouraging.

Lately at Kingston Hospital I have had two cases of carcinoma of the cervix with marked involvement of the bladder, causing in one a vesicovaginal fistula and in the other marked frequency and dysuria. I treated them with radium, and then my surgical colleague, Mr. R. H. Franklyn, transplanted the ureters into the colon; and later we successfully performed a Bonney-Wertheim hysterectomy with total cystectomy. The freedom from worry about the ureters was a great consolation to me as a gynæcologist.

I, too, would like to put in a plea for increased teamwork not only between the radiotherapist and gynæcologist but with our genito-urinary and other surgical colleagues, until the cures for cancers have been found.

May I take this opportunity to add my words of praise and admiration of Mr. Victor Bonney's great work. I would like to see this great gynæcologist and teacher receive some further honour from his well-wishers in appreciation of his unequalled effort.

London, W.1. J. V. O'SULLIVAN.

HOUSE APPOINTMENTS

SIR,—There has been much recent discussion of consultants' salaries, distinction awards, and general practitioners' incomes, but the matter of house-officers' salaries does not appear to evoke the sense of urgent enthusiasm which it merits. No-one denies that their salaries should be increased in accordance with the Spens report. Surely this should be done today and not left to some tentative date in July.

I hope that some of the "negotiators" have seen an advertisement in your issue of April 23:

"Part-time Casualty Officer (non-resident).... Times are Monday to Friday inclusive, 9.30 A.M. to 5 P.M. Salary £150 per annum and meals on duty."

Can a doctor live on £3 a week however rigid his bachelor existence? If not, how does he earn, outside the hours mentioned, enough to pay for bed and breakfast and dinner?

I need not expand this theme. House-officers appear to have no effective advocate of their cause. No trade union would permit its members to be employed under the conditions mentioned above.

C. D. CALNAN.

1. Goodwin, A. *Lancet*, 1939, i, 1142.

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ACADEMIC FREEDOM AND THE HEALTH ACT

SIR,—Dr. Russell Brain's letter in your issue of March 12 trails several red herrings. My objections to the present Act are to the monopoly which it confers on the State and to the tremendous powers it hands over to the Minister. Once admit that this monopoly and these powers are good, then all further argument about the Act is futile. Personally, I am entirely sceptical about the total planning of the medical profession, and more than alarmed when its educational institutions and organisations become closely identified with the State. A brief definition of the State is impossible, but it is certainly not "the medical officers and lay officials of the Ministry of Health," as suggested by Dr. Brain. I must leave others to decide whether the president of the Royal College of Physicians of London is now the head of a corporation of physicians or whether his position as chairman of the Distinction Awards Committee makes him a State servant.

I have no doctrinaire views about the running of the medical services, but I believe that the quality and conditions of independent medical practice outside any State scheme will in the long run be the factors determining the quality and conditions inside any State scheme. Medicine has functions towards the community which are not co-extensive with those of the State, and I am anxious that the colleges and the universities should not merely become identified with the State because of official pressure.

Academic freedom is the apex of the pyramid based on many other freedoms throughout the community. The situation regarding academic freedom within medicine is completely altered now that the Government has the monopoly of the medical educational institutions, for there can be no clinical teaching outside the Government service. The University Grants Committee has buffered the academic worker from the activities of the politician and the official, and a comparable method of buffering all undergraduate and postgraduate institutions from the activities of the Ministry of Health is imperative. In the issue of your journal which contains Dr. Brain's letter, the signatories of a letter dealing with the *National Formulary* wrote:

> "It is realised, however, that the staffs of teaching hospitals may have some misgivings about placing it without comment in the hands of medical students, since it contains preparations which can justifiably be criticised."

In the interests of administrative convenience an approved *National Formulary* is published. Such a formulary may be valuable and its employment in academic medicine may be a relatively minor matter, but the extension of such processes may gradually produce a set of conditions imposed from without, which slowly and successfully limit the real independence of thought and action of the academic worker.

Dr. Brain's citation of the Medical Research Council to support his argument is completely irrelevant. My objection is to the situation produced by a Government monopoly. The Medical Research Council performs a very specialised function in relation to scientific medicine, and its founders had the good sense to put it under the Privy Council, which is at least a good deal quieter than the Ministry of Health! My letter contained no reference to civil servants, but the modern hybrid employé that is being produced has neither the advantages of the civil servant, nor the real advantages of being independent. The only real analogy for Dr. Brain is that of the hospital service of the Ministry of Pensions. This service is designed for a specific purpose. It has obligations to the pensioners, to the Treasury, and to the taxpayer, but I should certainly not be prepared to hand over to such an organisation the guardianship of academic freedom in medicine since the obligations to the Treasury are too immediate and too direct. Dr. Brain's letter is a testimony to his belief that the extension of State activity will promote academic freedom. Contemporary evidence hardly suggests this. In Czechoslovakia all students have just been subjected to "reliability tests," "norms" have been established, and the unsuitable students expelled.

Dr. Bourne in his letter of April 9 discusses economics, while I am concerned primarily with the relationship of medicine and the State, particularly as affecting education. Dr. Bourne will be aware that in the past the Royal Colleges have got into difficulties as the result of their monopolistic claims. At the present time the colleges have allowed their interest in medical monopoly to become fused with the interest of politicians who favour State monopoly. The taste, standards, and decisions of official academies are not always correct and should not be beyond criticism, and the recent exhibition of the Chantrey Bequest has been an interesting commentary on this. The Royal Colleges have weathered storms before and will weather the present one. Meanwhile, the real need is to protect Medicine and the colleges from the politicians. Thomas Wakley, the founder of THE LANCET, wrote in your columns of the Royal College of Surgeons as "the vile cave in Lincoln's Inn," and of the Royal College of Physicians as "the old dowagers of Pall Mall East." If such invective is no longer permitted to the editorial pen, at least criticism may still be called for and may still prove salutary.

London, W.1. REGINALD T. PAYNE.

A PLAN FOR THE AGED

SIR,—I read with great interest the article by Dr. Boucher in your issue of April 30 under the above title.

It seems to me that the approach so far to the problems of the old has been too much from the angle of morbidity and the treatment of disease, and too little from the aspect of maintaining as long as possible their health and happiness. In his suggestion that the name of the specialist concerned should be "gerocomist" rather than "geriatrician," Dr. Boucher evidently appreciates this fact, but his article is still dominated by that question of hospital treatment that seems to underlie so much planning arising from the National Health Service Act.

I would venture to suggest that the analogy among existing welfare services for a welfare service for the old is rather with maternity and child welfare than with tuberculosis. Old age is not in itself a disease, and there must be a normal old age—and for that matter a normal death—just as there is a normal childhood and a normal birth. It should be the aim of the Health Service to aid in the provision of circumstances conducive to these normalities at the one as at the other extreme of life. Childhood and a large number of births take place at home, and so should old age and a large number of deaths. The regional hospital boards are therefore concerned but incidentally, and the statutory bodies mainly interested should be the local health authorities. I personally regard the whole field of care of the old as the next great province of development of public health, as maternity and child welfare was between the two world wars.

JOSEPH V. WALKER
Darlington. Medical Officer of Health.

CHILDREN IN HOSPITAL

SIR,—Whenever I read that the answer to some common problem in human relations "must come from research, from pooling of experience, from coöperation among the professions . . ." I am reminded of Shaw's Black Girl, who knew, long before she had heard of Pavlov, that when a dog sees his dinner his mouth waters. Miss Anna Freud, with her gift of vivid illustration, did well to rub in what we all recognise without troubling to act on it—that a child and his mother are ill parted. Studies have shown what this separation does to the young child; but there are also those older children who spend as much as six or seven years, or even their whole childhood, in an orthopædic ward. Like children in other institutions, they grow up without close personal love; and they have two added misfortunes—they cannot get emotional release in physical action, and their education is often perfunctory. Such experiences harm not only emotional growth but economic prospects. Surely the answer is not to hope for some formula, distilled from research, which will teach every nurse to be a mother-who-is-not-the-mother, a beloved regent but never a usurper. The notion is unprofitable; one woman in twenty might achieve it after half a lifetime of training and self-discipline.

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Spence has solved the problem for the infant by accepting him and his mother as a unit, and taking both into hospital together. But the unit does not resolve at the end of the second year; it is slowly exchanged for a flexible partnership which lasts till the child's adolescence, and sometimes beyond. A lesson now being learned by the geriatricians might be followed. Children in orthopædic hospitals often have long intervals between operations. Would it not be possible to give such children the essentials of hospital care in their homes, anyhow for a substantial part of each year? A well-organised home service could arrange physiotherapy for those who needed it, or provide nursing care for those who were bedridden or in plaster. The child would get his share of home life and affection; and even if his schooling still had to be given during his terms in hospital, at least he would be gaining, while at home, that practical experience of life which the institutional child so greatly needs and covets.

CANDIDA.

DECAMETHONIUM IODIDE

SIR,—In their article last week Dr. Davies and Professor Lewis give a valuable account of the use of decamethonium iodide and *d*-tubocurarine chloride in electroconvulsive therapy.

The relative duration of the recovery period in these cases merits further consideration. The effects of a curarising dose of *d*-tubocurarine persist on average for 30–40 minutes; in the case of decamethonium iodide the average duration of action is 15 minutes. Since rapid recovery from the effects of the drug is obviously desirable in these cases, decamethonium iodide would at first seem to be preferable. It has been observed,[1] however, that the effects of *d*-tubocurarine pass off twice as rapidly in patients submitted to an electrically induced convulsion as in subjects receiving the same dose without a convulsion. I have observed no such de-curarising effect where decamethonium iodide has been used in electroconvulsive therapy, and it would seem that there is little to choose between the two drugs on the ground of duration of action.

It has been suggested that electrical stimulation leads to the liberation of increased amounts of acetylcholine at the neuromuscular junction and that this neutralises the effect of the *d*-tubocurarine; in the case of decamethonium iodide it is known that neostigmine is not an effective antagonist; so it is not surprising that electrically induced convulsions do not reduce its action.

In view of this difference in the action of the two drugs on the neuromuscular junction, one awaits with keen interest the results of a test of the effects of decamethonium iodide on a myasthenic subject; such an experiment may indicate whether idiosyncrasy to this drug is likely to be encountered in clinical practice.

Department of Anæsthetics, Westminster Hospital, London, S.W.1. C. F. SCURR.

RISK FROM ASPIRIN PREPARATION

SIR,—In his letter last week, Dr. Forster would seem to refer to our product 'Magsilate,' since we use the phrase "can be eaten like a sweet."

This tablet can be taken pleasantly and requires no water; and it offers other advantages such as complete disintegration before swallowing, the inclusion of antacids to prevent gastric irritation, and the sealing of the aspirin as a centre core to prevent deterioration. Incidentally, magsilate, which was evolved in our own laboratories, is entirely British. The only comments received from doctors have been of congratulation upon presenting aspirin in a palatable and convenient form.

Apparently Dr. Forster has overlooked the fact that the tablets are distinctively wrapped and in a package which bears a caution to keep them in a safe place.

Westminster Laboratories Ltd., London, N.W.1. E. W. GODDING.

1. Hobson, J. A., Prescott, F. *Brit. med. J.* 1947, i, 445.

Parliament

Nurses Bill

Lord SHEPHERD, in moving the second reading of this Bill, defined it as a finely balanced document, trying to please as many as possible of the parties interested. It increased the status and strength of the General Nursing Council, and put it on a more widely representative basis. The new statutory committee relating to mental nurses would have referred to it without question all matters concerning mental nursing that come before the council. In all probability the medical and other professions would receive notice of the members to be appointed by the Minister to this committee, and they would certainly be consulted in respect of the appointments. How far the student nurse could be given full student status remained to be seen, but the Bill created the conditions in which the answer might be evolved by trial and experiment. It provided for regional committees, independent of the hospital authorities, whose main duty it would be to coördinate training arrangements, and it provided for the expense of training to be separated from the expenses of hospital administration. The General Nursing Council was also given power to introduce experimental training.

Lord AMULREE suggested that it would greatly strengthen the General Nursing Council if there was medical representation on it. He thought that the continuing deficiency of nurses, in spite of the increasing number of student nurses compared with before the war, was due to the fact that they now worked in shifts, and had a 96-hour fortnight, in place of the much longer hours that formerly applied, and that it was unlikely that this gap would ever be filled entirely. He was not even sure that it was a good thing that it should be, because the type of young women now being taken in were well trained and educated, and he was not sure that we could afford to have a great number of these people taking care of the sick. The new council should make up its mind what functions a nurse should perform and keep her firmly to those functions, and not let her waste her time doing things which were not strictly nursing matters. He questioned putting the entire responsibility for the training of nurses on the nurse-training committees. Although a great deal should be done by them the final charge must be that of the management committees and boards of governors of the various hospitals. Some medical opinion should be given about the kind of training that was necessary.

Lord MORAN said the crux of the Bill was that for the first time the funds for nurse training were separated from the general hospital budget. In those few words nurses had been given a charter of freedom in regard to their training. Another provision almost equally important was that for bringing the standard of efficiency of the smaller hospitals up to the level of the best. Everyone would welcome the fact that there had been a bridge put between the teaching hospitals and the smaller hospitals in the shape of the standing nurse-training committees, and that financial powers had been given to them. But it was another story when they came to the other executive function of these committees, that of examining. The central State examination established in 1919 had done a great deal to raise the minimum standards everywhere. From now onwards he was afraid they would have to admit that there would be no national minimum standard. The more they were driven to shifts and expedients to meet the shortage of nurses, the more essential it was that they should preserve the standard they had known in the past. That was why he and others felt concern that the teaching hospitals were put into the regional machinery for this purpose of training nurses. This was the first departure from the principle laid down by the Minister in the National Health Service Act that teaching hospitals should be kept outside the regions, so that the "growing edge" of medicine should not be blunted.

Lord WEBB-JOHNSON also welcomed the introduction of a measure providing for the independent financing of the training of nurses, but he was disappointed that the General Nursing Council should have been selected as the body for the general control of funds for this purpose.

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If the original anxiety was to separate educational grants from ordinary hospital maintenance grants, he suggested that from the Exchequer the grants should pass through either the Ministry of Education or some body comparable to the University Grants Committee. If it was ultimately decided that the General Nursing Council should be the body to administer these funds, then indeed the constitution of the Council became of paramount importance. He suggested that the standing nurse-training committees would be better called councils. That would avoid the possibility of their appearing to be subservient to some other body in the region. The regional boards were to appoint some of the members, and were to be responsible for providing officers, servants, and accommodation. That, to his mind, made it inevitable that these committees would be largely under the control of the regional boards. If that was so, he agreed with Lord Moran that it was a matter for great anxiety if the teaching hospitals were to be brought under the control of such a committee and of the regional board.

Replying to the debate, Lord SHEPHERD said that the Minister had for many years past included medical representatives and hospital administrators among his nominees to the General Nursing Council, and there was no reason to suppose that any change in this practice was likely in future. It would be open to the regional hospitals boards or the boards of governors of teaching hospitals to include medical representatives among the members to be appointed by them to the standing nurse-training committees, and the Minister considered that at present it was unnecessary to specify that more precisely in the Bill.

There need be no fear that the standard of training would be lowered by reason of the regional examinations. Not only would the General Council be involved, but the Minister would be anxious to ensure that the training should be efficiently done, in accordance with the plans laid down by the council. Under the Bill the teaching hospitals would be given the opportunity to raise the whole level of nurse training throughout the country. They could not make their influence felt if they were kept in isolation.

QUESTION TIME

Homœopathic Treatment

Mr. F. W. SKINNARD asked the Minister of Health whether he would arrange that lists of homœopathic medical practitioners, similar to publicly exhibited lists of practitioners in other specialised fields of medical service, were provided for the information of persons desirous of homœopathic treatment.—Mr. ANEURIN BEVAN replied: In my view it would not be in the public interest to seek to distinguish different forms of therapy practised by doctors providing general medical services.

Mr. SKINNARD: Is the Minister aware that a number of patients are asking for this information, which is normally given in such lists, and is it not rather unfair to the patient demanding this type of service that the only source of information is the executive councils, who may regard this form of practice as heretical?—Mr. BEVAN: Various forms of health treatment differ very often with the doctors who are giving them. It is very undesirable indeed to distinguish between one form of treatment and another. Homœopathic treatment can be given by registered medical practitioners, and there is no reason why it should be distinguished from other forms of treatment.

Dr. S. SEGAL: Is the Minister aware that it is felt to be unethical for any doctor to advertise himself as a practitioner in a particular form of treatment? Mr. SKINNARD: Is the Minister aware that the question does not ask that a doctor shall advertise himself, but that information shall be given to patients?—Mr. BEVAN: It would have the effect, however, of tending to advertise certain forms of treatment.

Medical Practitioners and Pharmacists Act

Mr. W. WELLS asked the Minister how many applications had been made for registration in the Medical Register under section 3 of this Act; how many such applications were now pending; for how long they had been pending; and when they would be decided.—Mr. BEVAN replied: 174, of which 39, made at varying dates during the last year, are still pending. The decision of 9 of these has been deferred for the time being in the applicants' own interest (they are abroad and cannot be registered unless resident in the U.K.); further information is awaited from 10, and an early decision is expected on 3; one application was received a few days ago. The remaining 16 involve legal questions of some difficulty which the General Medical Council are endeavouring to resolve as speedily as possible.

Treatment for Rheumatism

Colonel M. STODDART-SCOTT asked the Minister if provisions are made in the Harrogate and other regional-board rheumatic schemes for the treatment by radiotherapy of the form of rheumatism which was so crippling to young and active members of the community and which is known as spondylitis.—Mr. BEVAN replied: It is the responsibility of regional hospital boards to provide for an accepted form of treatment such as this, though the necessary radiotherapy facilities may not be available everywhere yet.

Colonel STODDART-SCOTT also asked which regional hospital boards had schemes for the treatment of rheumatism similar to the Harrogate scheme which the Leeds regional board are sponsoring.—Mr. BEVAN replied: So far similar arrangements have been made in the Manchester and South Western regional hospital areas. It is intended to develop them elsewhere as medical and other resources allow.

Supplies of Insulin

Replying to a question Mr. BEVAN stated that imports of pancreas for manufacture of insulin had not been affected by any fall in meat imports.

Smallpox

Sir JOCELYN LUCAS asked the Minister what precautions were taken on s.s. *Mooltan* to prevent the spread of smallpox; and whether any safeguards were taken to prevent risk of infection to the 400 dockers who had to board the ship.—Mr. BEVAN replied: The first case of smallpox was not diagnosed till the ship reached port, so that no precautions had been taken while it was at sea beyond isolating the passenger concerned, who was judged to be suffering from chickenpox. No dockers or other persons were allowed on board until the port medical authorities were satisfied there was no risk of infection.

Mrs. E. M. BRADDOCK: A smallpox contact case can refuse vaccination, and will the Minister consider some method whereby action can be taken in the case of a person known to be a contact who refuses vaccination?—Mr. BEVAN: This involves the very serious matter of the liberty of the subject, and I should not like to give an off-hand reply to it. We cannot, obviously, without the most careful consideration and legal safeguards, push needles into people whether they want to have them pushed in or not.

In a further reply Mr. Bevan added that he would see whether it was possible to exercise a little more control over cases of infection of this sort where they knew the period of incubation had not been completed and the individual concerned would not take medical precautions, but they must be very careful that they did not give officials high-handed powers to act over the lives of private citizens.

Supply of Hearing-aids

Replying to a question Mr. BEVAN stated that no 'Medresco' aids had been exported, but any manufacturer might use the published specification and design for production and export of similar aids. He was informed by the President of the Board of Trade that exports of hearing-aids are not recorded by quantities. About 19,000 patients in England and Wales had been supplied with medresco aids since July 5. The number needing aids was not known, but was not likely to be less than 150,000.

Sight Tests

In answer to a question Mr. BEVAN stated that it was estimated that up to March 31, 1949, about 5,620,000 sight tests had been made, but it was not known how many of these were examinations for the first time.

Teaching Material

Mr. WALTER FLETCHER asked the Minister whether his regulations permitted any user of the National Health Service when under treatment or examination to be employed as an exhibit for the instruction of students.—Mr. BEVAN replied: Medical and other students must in the future as in the past gain their clinical experience by seeing patients under treatment or examination, and I see no objection to this practice.

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Public Health

MORE PLANS FOR OLD PEOPLE

WE have now reached the stage of knowing what we ought to do for the elderly even if we do it only sporadically and incompletely. At a conference held in Liverpool, early in April, by the Medical Society for the Care of the Elderly some plans now maturing and others in prospect were discussed. A Liverpool geriatric advisory committee has been set up to study the situation. Dr. Lloyd Hughes noted that the aged and chronic sick in the region are at present increasing in numbers by about 60 a year; and the advisory committee is facing the same difficulty which has puzzled the rest of the country—what is to be done with old people who are well enough to leave hospital but have no homes to go to? It is possible that the Nuffield Foundation will establish some half-way houses in the Liverpool region for such old people.

Social and psychological factors affecting old people are already being studied; they are as important, Dr. C. O. Stallybrass pointed out, as physical factors. Nevertheless, physical treatment carried out in an inspiring atmosphere can do much for the mind as well as the joints: he spoke of the forceful and lively determination of Mr. J. P. Heron, the orthopædic surgeon to the physiotherapy department of Belmont Road Hospital. The old, like the young, respond to enthusiasm and profit by team-work. "Ex inertia nihil fit," he said—a motto which might also be adopted, we suggest, by those responsible for reablement elsewhere than in geriatric departments. Physical treatment can be given in an outpatient department if old people are provided with the means of getting to hospital.

Dr. Trevor Howell put the case for more outpatient clinics combined with home visits to old people; if they can be kept alert and active at home they need not block hospital beds. Sometimes their inability to do their own shopping or cooking may mean that they are chronically ill nourished; and Dr. H. Fuld has found that the low protein intake of some of these old patients brings them to hospital with tissue wastage, anæmia, and œdema. Vitamin deficiencies, too, are not uncommon, especially among those who live on bread-and-jam and tea. Meals-on-wheels, regular visits from a social worker, and a home help all help to protect the old from these dangers.

An old person is not less a person for being old. Indeed the foibles of our early years are commonly caricatured in the eccentricities of our age, so that the older we get the more like ourselves we become. Even in senile dementia the bones of the character withstand the distortions of the disease; and Dr. J. W. Affleck rightly insisted that the old person in this declining state must be regarded as a person, not as a "case"—of paranoia or confusion. The type of mental illness is modified not only by the original character but by loneliness, dependence on others, physical disability, and, above all, loss of self-esteem—not an easy thing to recover at any age. It should be possible, he thinks, to delay the onset of these troubles of senescence by suitable attention to mental health. Long rest in bed does not help either the mind or the body; for the old body it means loss of power and the onset or fixing of deformities, for the mind apathy. Dr. Marjory Warren urged that all disabilities limiting movement should be treated actively.

Lord Amulree reminded the conference of the interest which the Ministry of Health is taking in the prevention and treatment of sickness in the elderly. He advised those who have the care of the aged sick in their hands to make their needs and plans known to their hospital management committees and regional boards. Any suggestions they can make which will free beds badly needed by acute patients will be welcome to the Ministry.

Classification of Occupations

The classification of occupations used in connexion with the 1931 population census has been revised at the General Register Office, but the revised edition is not yet ready for publication. The new classification will follow a similar arrangement to that of 1931. The General Register Office suggest that in designing machine-cards on which to record morbidity data by punched holes, it would be appropriate to reserve three columns, as with the 1931 classification, for the occupational code-number, with an additional column if it is anticipated that finer subanalyses will be required. Another column should be reserved for the social class grouping if it is intended to include this on the card.

Typhoid Fever

Cases of typhoid fever associated with the outbreak at Crowthorne, Berkshire, have been reported from Camberley, Didcot and Ramsgate; and the total is now 38. The source and mode of infection has not yet been discovered, but the evidence suggests that the vehicle of infection was distributed only in Crowthorne and for a short time, probably about April 16. The initial fear of a very large outbreak may therefore prove unwarranted.

Smallpox

No further cases have been reported among passengers from the s.s. *Mooltan*. On May 7 an unvaccinated young woman, aged 20, was admitted to Liskeard Smallpox Hospital, Cornwall, from a village a few miles away, as a suspected case of smallpox; and the diagnosis has since been confirmed by laboratory tests. A *Times* correspondent (May 10) observes that two weeks previously a passenger from the ship died from the disease in this hospital; but so far no connexion between these cases has been established.

Deaths in 1948

Last year the maternal mortality in England and Wales was the lowest ever recorded. Provisional figures published by the Registrar-General [1] show a rate of 0·86 per 1000 total live and still births, compared with 1·02 in 1947 and 2·70 in 1938. Excluding abortion, 685 mothers died in childbirth. Deaths due to abortion numbered 123, representing a rate of 0·15 per 1000 total live and still births, compared with 0·16 in 1947 and 0·55 in 1938.

Tuberculosis.—Among men there were 11,314 deaths from respiratory tuberculosis, representing a rate of 555 per 1,000,000 civilian population, compared with 595 in 1947. For women the rate which rose from 345 in 1946 to 364 in 1947, also declined in 1948 to 335 per 1,000,000 civilian population; the number of deaths among women was 7487. Deaths from other forms of tuberculosis were 1473 for men and 1396 for women, the corresponding rates per 1,000,000 civilian population being 72 and 62 respectively; this was a decrease for both sexes, the previous year's rates being 87 and 73 respectively.

Cancer.—Deaths among women numbered 39,404 and the crude rate increased slightly, being 1761 per 1,000,000 civilian population compared with 1754 in 1947. Male deaths totalled 40,027, giving a rate of 1965, which was slightly lower than the figure of 1976 for 1947. As in 1947, the over-all cancer death-rate was 1858 per 1,000,000.

1. Registrar-General's Weekly Return of Births, Deaths, and Infectious Diseases for the Week ended April 24, 1948. H.M. Stationery Office. Pp. 20. 6*d*.

Notification of Infectious Diseases

ENGLAND AND WALES

—	Week ended April				
	2	9	16	23	30*
Cerebrospinal fever	30	39	28	34	32
Diphtheria	105	106	103	95	98
Dysentery	62	63	49	52	38
Encephalitis lethargica	..	3	..	..	..
Food-poisoning	8	20	17	27	62
Measles, excluding rubella	15,819	14,724	13,135	13,519	11,436
Ophthalmia neonatorum	29	56	44	51	44
Paratyphoid fever	2	5	2	7	1
Pneumonia, primary or influenzal	1481	1093	735	759	453
Polioencephalitis	2	..	2	1	1
Poliomyelitis	13	14	5	8	14
Puerperal pyrexia	110	96	81	94	80
Scarlet fever	1257	1191	1042	935	785
Smallpox	..	4	7	5	..
Typhoid fever	1	1	2	3	6
Whooping-cough	2998	2608	2285	2546	2905

* Unrevised figures.

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Obituary

GEOFFREY SECCOMBE HETT

M.B.LOND., F.R.C.S.

Mr. Seccombe Hett, consulting surgeon to the ear, nose, and throat department of University College Hospital, died on May 3 at the age of 70.

The son of another Geoffrey Hett, who was for many years in practice in Bayswater, he was educated at St. Paul's School and University College, London. After qualifying in 1903 he early decided to specialise in otolaryngology, and after some years of postgraduate study in London, Vienna, and Freiburg he took his F.R.C.S. in 1908. Later he was appointed assistant surgeon to the London Throat Hospital, and to the Throat Hospital, Golden Square. He also became curator of the anatomical museum and assistant in the department of anatomy at University College, and this double interest led to his researches on the comparative anatomy of the tonsils.

During the first world war he held the rank of major in the R.A.M.C. and was in charge of Lord Methuen's Convalescent Hospital at Corsham Court, and later of the Middleton Park Red Cross Hospital for Head Injuries. During these war years he also undertook plastic surgery at the Queen's Hospital for Facial Injuries, Sidcup. Besides his appointment at University College Hospital he was at various times a member of the staffs of the Cassel Hospital for Nervous Diseases, the National Institute for the Blind, and Royal London Ophthalmic Hospital.

E. S. writes of his old chief and friend: "I became Hett's assistant at U.C.H. in 1928, and our association lasted for about five years. I was lucky enough to 'devil' for him in private as well. With the late Mr. Waugh of Great Ormond Street, he was a pioneer of modern tonsil dissection. His plastic surgery at Sidcup during the 1914–18 war, combined with his research work at the Zoo, gave him a much wider field of knowledge than falls to the lot of most ear, nose, and throat surgeons. He had a vast knowledge of bird life in England, and was a keen supporter of the Society of Ornithologists. An excellent shot, in later life he also took up fishing; and, combining these two hobbies, he went on blue-shark shooting expeditions off the west coasts of Scotland and Ireland. He was a most enthusiastic and delightful teacher, and his students benefited from his sure knowledge and vast experience in dealing with patients."

LUDWIG HALBERSTAEDTER

Dr. Halberstaedter, whose death was reported last month, was a pioneer of experimental radiology. Born in Silesia in 1876, he studied medicine at Breslau, and began his research career with a study of the action of X rays on the ovary, the results of which appeared in 1905, just before Bergonié and Tribondeau's report on the action of radiation on the reproductive system. In 1907 he went on a research expedition to Batavia, and with von Prowazek published a description of the inclusion bodies in trachoma (Halberstaedter-Prowazek bodies). Returning to Europe, he specialised in dermatology and took a particular interest in radiation as a therapeutic agent.

After the first world war he became director of the radiotherapy section of the Berlin Cancer Institute, in which capacity he attended the First International Congress of Radiology in London in 1925. At this time he was mainly concerned with the treatment of malignant disease by thorium, in which he used seeds, needles, and moulds. He was also interested in the treatment of carcinoma of the larynx by a fenestration method. His experimental work included studies on the radiation of small organisms such as algæ and trypanosomes. As early as 1932 he began to investigate the biological action of million-volt X rays, and he also used the cathode-ray tube, developed by Brasch and Lange, as a source of radiation.

He left Germany in 1933 and took charge of the radiotherapy department of the Hadassah Hospital, Jerusalem, which became the largest radiotherapy centre in the Near East. His particular interest now lay in irradiation of tissue cultures and other relatively simple biological materials such as blood corpuscles. His department was destroyed in the 1948 unrest, shortly after his collaborator, Doljanski, lost his life, and these calamities affected his general health. He died suddenly while on a visit to the U.S.A.

Halberstaedter was fond of teaching and gave his students freely of his wide experience. For recreation he turned to photography and music; and while he loved serious conversation, he had a great sense of fun and a gift of repartee. He is survived by his wife, a daughter, and two sons, one of whom is studying medicine in London.

DR. BARCLAY

A. E. Barclay was one of the original members of the Gastro-Enterological Club and its first radiologist. He took the keenest interest in the club from its inception and was ever fertile with suggestions for its development. He made many original communications himself and sponsored others, in advances in radiological technique and interpretation. Characteristically he demurred when the club became a society, fearing that the convivial atmosphere and intimate discussions of the one might be submerged in the more formal debates of the other; but his support never wavered. He will be remembered for his professional distinction, his invariable courtesy in argument, his humility, and his good will towards all men.

T. L. H.

Anyone who read your obituary of Dr. A. E. Barclay will have appreciated his wide human sympathies. May I give one example of his kindness? Early in the late war I went to catch the 8.40 A.M. train from Oxford to Paddington. At the booking-office I found that I had left my note-case behind. Dr. Barclay, seeing my distress, left his place at the head of the queue, and came over to me and said: Can I help you?

I had never met him before, and I have been grateful to him ever since.

G. S. W.

My thoughts in the last few days have turned especially to the courage which Dr. Barclay displayed in the concluding months of his life. He was grievously ill; but he refused to regard his failing strength as more than just another obstacle which must be circumvented so that progress could still be made with his investigations. Yet he had his own particular sense of proportion, and in one of his last letters he said: "I wonder if any other man had such a lot of fun out of research—and I never took it, or myself, seriously. It is others who have forced me to try to do so, but thank goodness it is too late now." He liked to recall the dramatic side of his work on the gastric shunt, "which, once we got the idea, was as simple as shelling peas."

"Every single little move and experiment came off, and the whole thing was done in a week or so and under the most fantastic conditions. The radiographs of the filled stomach had been made, and I was in hospital across at the Radcliffe. I slipped over to the Institute and made the microphotos that were decisive (the ones published in the paper [1]) and had to leave them to be developed while I went back to get my belly shaved. I saw the results next day on the way to the operating-theatre and dictated a note to Bentley about them!"

Last autumn, knowing that he would have to be away for several months from his much-loved laboratory in Oxford, he wrote:

"I believe I could fit up a small room in the hotel (at Torquay) quite easily on a makeshift basis and install all the necessary apparatus at a comparatively small cost

1. Barclay, A. E., Bentley, F. H. *Brit. J. Radiol.* 1949, **22**, 62. See *Lancet*, Feb. 12, p. 267.

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as the apparatus merely sits on the floor and takes only ordinary lighting current while to darken the room and instal a temporary bench and photographic sink would present no difficulty. I think the hotel people would be willing to let me have a small back room or bathroom for the job for they are exceptionally nice. . . . Do you think I am quite mad, I sometimes think I am and perhaps I am not wrong ? "

There was a little delay, but on Boxing Day came the news : " All set for Torquay next week." Then a few days later :

" Here we are ; the lab is near ready after a few teething troubles which the excellent lab boy has dealt with, for I have not yet got over the journey and am fit for little. . . . How odd it is to be in the middle of work of such importance and nearly all of it promising great dividends with comparatively little labour—a ripe orchard with fruit just waiting to be plucked. Oh that I had the strength—maybe if I had the strength I should do more and accomplish less ! "

But it was a losing fight. After a few weeks he wrote :

" The lab and everything else here works A.1 right up to schedule, but alas I have to acknowledge that this last month I have gone downhill so rapidly that it is as much as I can do to get down and back from the lab. . . . Hence this is to give warning that I may have to throw my hand in very soon and almost waste all the excellent facilities I have here—what a lot one could have done with them. . . ."

A week later came an enthusiastic letter, not because there was any improvement in his health but because, " as much to keep the lab boy employed as for any other reason, I got him to make exposures using the vacuum cassette that allows the very soft X rays to reach the photographic plate."

" It looks as if . . . we can get the type of result we aim at, but only on an experimental basis, for the control of the apparatus is too fickle and the exposure runs to hours. It is not practical as a routine. But it tells quite definitely, if confirmed when we get back, that with the new thin window tube, giving enormously increased volume of thin very soft rays and an apparatus that is suitably controlled and calibrated, we can get very near to, and will probably attain, the microradiohistology we need for the detection of drugs, &c., in cells. So I am very pleased ; for, if these two crude results are confirmed, it entirely justifies all the expense and upset of the Torquay experiment."

Towards the end of February he said : " It looks as if I must write myself off as an active worker. But the top story carries on." And, as proof, several pages of notes were enclosed, suggesting some quite new investigations.

So the letters came to an end. Letters from an old man, yet they had all the vitality and enthusiasm of youth ; letters from a very sick man, they discounted illness as something that was a nuisance and that must be got round ; letters from a wise and brave man, they tell the story of a struggle against bitter odds to complete a task of the kind that can, perhaps, never be completed. L. B.

A memorial service has been arranged by the British Institute of Radiology and will take place at St. Peter's Church, Vere Street, London, W.1, on Friday, May 20, at 11 A.M.

Appointments

CAPLIN, HENRY, M.D Lond. : pathologist, Connaught Hospital, London.

GARDNER, E. K., M.B. Camb., F.R.C.S., D.A. : anæsthetist, Whipps Cross Hospital, London.

HOPKINS, S. J., PH.D., B.SC. Lond., M.R.C.S. : pathologist, Bethnal Green Hospital, London.

MATHESON, BERNARD, M.B. Edin., D.P.M. : physician-superintendent, South Ockendon Institution, London.

MOYNAHAN, E. J., M.R.C.P. : asst. physician, dermatological department, Guy's Hospital, London.

Diary of the Week

MAY 15 TO 21

Monday, 16th

UNIVERSITY OF LONDON
5.30 P.M. (King's College, Strand, W.C.2.) Prof. Kl. Gollwitzer-Meier (Hamburg) : Venous Return in Health and Disease.

UNIVERSITY OF BIRMINGHAM
4 P.M. (Medical School.) Prof. E. B. Verney, F.R.S. : Excretion of Water by the Kidney. (Third William Withering lecture.)

Tuesday, 17th

ST. MARY'S HOSPITAL MEDICAL SCHOOL, W.2
5 P.M. (Wright-Fleming Institute.) Mr. W. T. J. Morgan, F.R.S. : Bacterial Antigens. (Second of six Almroth Wright lectures.)

INSTITUTE OF DERMATOLOGY, 5, Lisle Street, W.C.2
5 P.M. Dr. D. I. Williams : Sex Hormones in Dermatology.

UNIVERSITY OF BIRMINGHAM
4 P.M. Professor Verney : Excretion of Water by the Kidney. (Last William Withering lecture.)

EDINBURGH POST-GRADUATE BOARD FOR MEDICINE
5 P.M. (University New Buildings, Teviot Place.) Prof. C. H. Stuart-Harris : Viruses and Acute Pulmonary Disease in Man.

UNIVERSITY OF LONDON
5 P.M. (London School of Economics, Houghton Street, W.C.2.) Sir James Ross : National Health Service. (Second of three lectures.)

Wednesday, 18th

UNIVERSITY OF LONDON
5.30 P.M. (King's College.) Professor Gollwitzer-Meier : Blood-reaction and Blood-flow in Muscular Activity.

UNIVERSITY OF OXFORD
5 P.M. (Radcliffe Infirmary.) Dr. Franc D. Ingraham : Neuro-surgical Problems of Childhood.

Thursday, 19th

ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE, 26, Portland Place, W.1
7.30 P.M. Prof. B. Malamos (Athens) : Tropical Diseases in Brazil.

BRITISH ASSOCIATION OF PHYSICAL MEDICINE
5 P.M. (Royal College of Surgeons, Lincolns Inn Fields, W.C.2) Dr. Graham Weddell : Mechanism of Pain.

ST. GEORGE'S HOSPITAL MEDICAL SCHOOL, S.W.1
4.30 P.M. Dr. A. Feiling : Neurology lecture-demonstration.

BRITISH INSTITUTE OF RADIOLOGY, 32, Welbeck Street, W.1
8.30 P.M. Dr. Hugh Davies : Medical Radiology—Retrospect and Prospect. (Presidential address.)

UNIVERSITY OF EDINBURGH
5 P.M. (University New Buildings.) Prof. H. S. Raper, F.R.S. : Fat Absorption. (Sharpey-Schafer lecture.)

Friday, 20th

FACULTY OF RADIOLOGISTS
2.15 P.M. (Royal College of Surgeons.) Dr. P. Flemming Møller (Copenhagen) : Value of X-ray Examination in Bronchogenic Cancer.

Births, Marriages, and Deaths

BIRTHS

BINGHAM.—On April 30, at Northampton, the wife of Dr. W. G. A. Bingham—a son.

BONHAM CARTER.—On May 4, in London, the wife of Dr. R. E. Bonham Carter—twin daughters.

GUNSON.—On April 30, in Malta, the wife of Surgeon Lieutenant G. H. Gunson, R.N.—a daughter.

MAXWELL.—On May 4, in London, the wife of Dr. James Maxwell—a son.

MOSS.—On May 2, in London, the wife of Captain H. J. Moss, R.A.M.C.—a son.

ROOKE.—On April 30, at Plymstock, Devon, the wife of Dr. C. J. Rooke—a daughter.

SEATON.—On April 25, in Dublin, the wife of Dr. Philip Seaton—a son.

TWIGG.—On April 19, the wife of Surgeon Rear-Admiral F. J. D. Twigg, C.B.E.—a son.

VINE.—On April 28, at Johore, Bahru, Malaya, the wife of Mr. L. Edwin Vine, F.R.C.S.—a son.

WALTON.—On April 29, at Birmingham, the wife of Dr. Kenneth Walton—a daughter.

MARRIAGES

MATHEWS—ARONSON.—On March 19, at Nairobi, Thomas Campbell Herbert Mathews, major, R.A.M.C., to Dorothea Marguerite Aronson.

SCHURR—TODD.—On April 30, at Cuckfield, Peter Howel Schurr, F.R.C.S., to Susan Todd.

DEATHS

COPEMAN.—On May 6, at Hove, Alfred Heathcote Copeman, M.A. M.D., Dubl., aged 80.

HETT.—On May 3, in London, Geoffrey Seccombe Hett, M.B. Lond., F.R.C.S., aged 70.

NEYLON.—On May 3, in London, Michael Louis Neylon, L.R.F.P.S.

RIDDELL.—On May 4, at Bowness-on-Windermere, David Riddell, M.D. Glasg., aged 71.

STRACHAN.—On Feb. 20, at Johannesburg, Archibald Sutherland Strachan, M.A., M.D., B.SC. Glasg., M.R.C.P.

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Notes and News

THE NATZWEILER TRIAL

THE heroic women who, landed from aeroplanes or by parachute, entered occupied France in the late war to establish communications with the Resistance Movement, took their lives in their hands. Eight who had been captured were sent to Karlsruhe Gaol in May, 1944. Four were sent to Natzweiler Prison, arriving during the afternoon of July 6. An hour or so later they were taken singly to the crematorium, injected with 'Evipan' or phenol and immediately cremated. There had been no trial and no warning to them of their impending fate; they were told apparently that the injection was for typhoid fever.

Ten of the staff at the Natzweiler prison camp were tried in May, 1946, before a British military court.[1] The charges alleged violation of the laws and usages of war. Article 30 of the Geneva Convention prescribes that a spy, even when taken in the act, must not be punished without previous trial. International law forbids the summary execution of a disarmed enemy absolutely. The defence was in part a plea that the killing was the execution of a sentence presumably passed after some kind of investigation by higher authority; in part it was a plea of obedience to superior orders. Rohde, the prison medical officer, urged that, in making the injection, he employed the most humane method of putting the victim to sleep. His case was that he did not like what he did, but he had to do it. He admitted injecting the first victim but said he then lost his nerve and another doctor (not before the court) injected the three others.

The Judge Advocate, summing up, asked the court to apply its military knowledge. Conditions in the German army, he said, might have differed, "but there is nobody more independent of military discipline than the medical officer; it is always open to him to express a contrary view at least and indeed any sort of view . . . he is in a very different category from the ordinary soldier." The Judge Advocate emphasised that Rohde was an educated man who could have refused to obey the order to kill. "So far as a doctor is concerned, there are a thousand and one ways of escaping a duty of this kind; he would only have had to say 'I have lost my dope' or 'broken my needle' or something of that kind." Rohde had never asked to see the orders or the execution warrant; he had never inquired about the trial.

Be that as it may, and whatever the aptitudes and opportunities of medical officers, Rohde was the only one of all the accused in the Natzweiler trial who was sentenced to death.

LINCTUS DIAMORPHINÆ

IN connexion with their recent notice (*Lancet*, April 23, p. 717), the Ministry of Health point out that the only prescriptions for dangerous drugs which may be ordered by title are those named in the *B.P.*, the *B.P.C.*, or the Drug Tariff; all other prescriptions not written out in full cannot be dispensed and must be returned to the doctor for amplification. Since the *N.(W.)F.* is no longer a recognised formulary, a chemist would be acting illegally in dispensing linct. diamorph. *B.P.C.* when linct. diamorph. *N.(W.)F.*, which is no longer included in the Drug Tariff, is prescribed.

MEDICAL FILMS

The Multiple-pressure Technique of Vaccination is the method now recommended by the Ministry of Health. The film illustrates storage of the vaccine, and goes on to show in detail primary vaccination of an infant in the home and revaccination of an adult. He is supposedly engaged in a dirty type of work, but even so an "occlusive" dressing, recommended in the film, should be avoided. Production is good, and all the salient points are clearly demonstrated; the diagrammatic representation of the actual multiple-pressure technique is particularly well done.

The film, made by Dr. Brian Stanford, may be had from the Central Film Library, Imperial Institute, London, S.W.7, in 16 mm. (silent, in colour); running-time 10 minutes.

Emulsions contrasts an emulsion and a suspension, and explains emulsifying agents and the nature of surface and interfacial tensions. The laboratory and industrial preparation of emulsions is shown, and the part emulsions play in our daily life is illustrated. Although apparently intended for beginners, the film is more suitable for revision; it would be useful in nursing training-schools as well as in medical schools.

The film, made by Verity Films, is available from Crookes Laboratories Ltd., London, N.W.10, in 35 and 16 mm. (black-and-white); running-time 15 minutes.

Ecole Decroly: une école nouvelle is a film, lasting 36 minutes, with sound in French, showing a day in the life of maladjusted children. It was selected for showing at last year's International Conference on Mental Health, and has been lent by the Belgian Embassy to the Scientific Film Association for circulation to interested bodies. Application for free loan should be made to the S.F.A. Medical Committee Film Librarian, 54, Upper Montagu Street, London, W.1.

REDUVIID BUGS

REDUVIID flying bugs belong to an ancient family which has existed ever since jurassic times, spread throughout the world, and evolved many species. Some of them are of medical interest because they are vectors of trypanosomes[1] which cause Chagas's disease when conveyed to man by the bug's bite (usually on the lips, wherefore they are called kissing bugs); but luckily most of them restrict their attentions to other insects, which they kill. In the last twenty-five years many new species of reduviids have been described in America, and the nomenclature had become rather confused; but now a systematic list of neotropical reduviids, together with a bibliography, has been published as monograph no. 1 of the Instituto de Medicina Regional in the University of Tucuman.[2]

MATERNITY IN MOSCOW

THERE is nothing like an iron curtain for provoking the curiosity of the neighbours. Mrs. Mary E. Poston, whose son was born in Moscow last May, had an opportunity of seeing the inside of a Russian maternity hospital, and gives a welcome first-hand account of it.[3] On admission she was stripped of all her personal belongings and clothing; even her wedding ring would have gone if it could have been made to come off. She was shaved, given an enema and a shower, clad in a white cotton shirt and cap, and a pair of sloppy felt slippers, and taken to the labour ward. Felt slippers were worn by most of the staff, and sound like a good method of reducing noise in hospital wards; but oddly enough Mrs. Poston remembers without much pleasure the sound they made on the stone floors. The labour ward was a large light green-painted room containing ten beds in charge of a sister with a nannya, or orderly, working under her. Half the beds were occupied by women in labour, and they had no hesitation in voicing their discomfort. Gas-and-air analgesia was available, but seemingly not much used; but at all events Mrs. Poston never heard anyone ask for it and be refused. Women who had had their babies, and were resting before returning to the general wards, also shared this room—presumably rather a disturbing experience.

Delivery was conducted in a separate delivery ward. Mrs. Poston notes that the standard of cleanliness was high, and the skill of the doctor considerable. Half an hour after the birth of her own child, another baby was born with blue asphyxia, and was treated expertly with no loss of time. Her only criticism is that after delivery a large ice-bag is placed on the mother's abdomen, to help the uterus to contract. When this befell her she was covered only with a cotton coverlet. It was too early in the morning for a cup of tea (which in Russia is still brewed all day long, as it was in Tolstoy's day, and is in England), so she grew colder and colder, and never warmed up again till she was taken, an hour later, to the theatre for a stitch. The ice treatment was maintained almost continuously for 24 hours, and at intervals during the next two days.

She speaks well of the careful and frequent washings she received while in hospital, but notes that no sanitary towels were used, though the draw-sheet was often changed. In the interests of perfect cleanliness she was denied some ordinary requirements, being allowed no hair-brush, face-cream, writing holdall, or knitting. On the other hand, no toilet paper was provided; and she had to explain that she wished to brush her teeth night and morning before she was given the opportunity to do it. She was not allowed to sit up in

1. War Crimes Trials, vol. v. Editor: ANTHONY M. WEBB, barrister-at-law, with foreword by Sir Hartley Shawcross, K.C., M.P., Attorney-General. London: Wm. Hodge. 1949. Pp. 233. 18s.

1. See *Lancet*, 1948, ii, 1032.
2. Wygodzinsky, P. Elenco Sistematico de los Reduviiformes Americanos. Tucuman, 1949.
3. *Nursing Mirror*, April, 23, p. 54.

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bed before the seventh day, and her husband—wearing a white cap and gown—was allowed to visit only once, and as an exceptional favour. The food—which included black bread, sour cabbage, and sour cream—was good but acid: she had to supplement it with fruit, butter, and jam or sweet things. For some reason the sisters were apt to cut down the fluid intake, but the nannyas could usually be prevailed on to supply tea or water at any time. The sisters had had a two-year training, and seemed very capable, like English nurses; but the doctors did much of the work which here would be done by sisters.

The babies were kept in a separate nursery, and had their own doctor and a rota of sisters to look after them. They were clean and well cared for, but kept very tightly swaddled and with their heads bound in linen. Cotton was put next the skin, not wool. They were not bathed for several weeks, and were fed at 3-hourly intervals, however large and lusty. The feeds were supplemented with rice water, and the child was test-weighed at every feed. No safety-pins, powder, or soap were used, and oil was applied when we should use zinc and castor oil. Mrs. Poston was never allowed to sit her baby up to bring up the wind, "for fear of damaging his back."

She considers the treatment she received came up to current English standards; and she makes the heartening observation that "there inevitably creep in many typically Russian inconsistencies." This phrase conjures up those warm-hearted woolly minded idealists of Russian literature, whom we loved like brothers. It is pleasant to know they are there all the time.

University of Oxford

On April 28 the following degrees were conferred:

B.M.—A. C. M. Mann, M. I. Davies, K. B. Taylor, M. W. Glossop.*

* In absentia.

University of Cambridge

Prof. F. G. Young, D.SC., has been appointed to the Sir William Dunn chair of biochemistry from Oct. 1. Dr. Young has held chairs of biochemistry at St. Thomas's Hospital and at University College. He was elected F.R.S. this year.

University of London

At a recent examination for the D.P.M. the following were successful:

W. W. Black, W. A. L. Bowen, F. H. Edwards, A. D. Forrest, P. M. Jeavons, J. D. Lucy, Betty E. A. Magill, D. V. Martin, Julius Merry, Philip Pinkerton, H. H. Robinson, John Todd, Lakshman Prasad Varma, J. M. White.

The William Julius Mickle fellowship for 1948–49 has been awarded to Dr. F. Avery Jones, in recognition of his work during the past five years. Dr. Avery Jones is senior physician to the Central Middlesex Hospital.

University of Glasgow

The following degrees have been conferred:

M.D.—Catherine I. Blyth, Cecil Harris*, William Laurie*, Turner McLardy†, Donald McPhee, R. A. Shanks†, Jane H. Short*, G. T. Stewart§, David Struthers‡.

Ch.M.—T. L. Chapman§.

* In absentia. † With honours.
‡ With commendation. § With high commendation.

The Bellahouston medal was awarded to Dr. J. S. K. Boyd.

Royal College of Physicians of Edinburgh

At a meeting held on May 3 with Dr. W. D. D. Small, the president, in the chair, the following were elected to the fellowship: G. Ormiston (Southampton), R. Y. Keers (Tor-na-Dee), G. R. Griffith (Caernarvon). Diplomas of membership were conferred on the following:

W. M. Harrowes, J. C. Hogarth, A. R. Piracha, R. M. Hayes, J. Pepys, A. L. De P. Carnegie, Ethel E. Robertson, E. G. McIntosh, H. M. Brown, G. H. Murray, J. M. Smith, J. Rabkin, J. H. Haldane, F. Stern, I. R. Wilson, I. Gordon, H. T. G. Strawbridge, G. H. M. Thornton, D. G. Illingworth, R. D. T. Cape, R. P. A. Cumming, J. W. Gibb, R. C. Nimmo-Smith, S. Rae, R. M. Jhala, R. D. Rowe, W. R. St. Clair.

Royal College of Surgeons of Edinburgh

At a meeting of the college held on May 3, with Mr. Frank Jardine, the president, in the chair, the following were admitted to the fellowship:

J. A. MacLeod, H. G. A. Almond, J. W. Boland, A. C. Clark, Mohiy Eddin Abbas El Kharadly, H. J. Fisher, H. H. Gilbert, H. A. Graham, Hrisikesh Hazra, Benjamin Joffe, L. A. Key, Peter Kinnear, T. H. Lawton, J. C. Miller, I. P. Munro, A. S. Oscier, E. W. Parry, R. P. Schach, A. J. Sinclair, Vincent Tabone.

Royal Faculty of Physicians and Surgeons of Glasgow

At a meeting of the faculty on Monday, May 2, with Dr. W. R. Snodgrass, the president, in the chair, J. F. Mair and William Roy were admitted to the fellowship qua physicians.

Association of Surgeons of Great Britain and Ireland

The annual meeting of this association will be held at Dublin from May 26 to 28 under the presidency of Prof. Henry Meade.

Westminster Medical School

The course on practical operative surgery for F.R.C.S. candidates to be held at Westminster Hospital, the Gordon Hospital, All Saints Hospital, and Westminster Children's Hospital will begin on Sept. 6 (and not Oct. 6 as at first announced).

Harveian Society of London

On Wednesday, May 25, Sir Gordon Gordon-Taylor will deliver the Harveian lecture at the Royal College of Surgeons, Lincoln's Inn Fields, W.C.2, at 5 P.M. His subject is to be the War Collection.

Royal Society of Arts

On Wednesday, May 18, at 2.30 P.M., at the house of the society, John Adam Street, London, W.C.2, Sir Alfred Egerton, F.R.S., will speak on Scientific Information Services.

Faculty of Radiologists

Prof. P. Flemming Møller (Copenhagen) will deliver the Skinner lecture at the Royal College of Surgeons, Lincoln's Inn Fields, London, W.C.2, on Friday, May 20, at 2.15 P.M. He is to speak on the Value of X-ray Examination in Bronchogenic Cancer.

Old People at Home

On July 20 and 21 a conference is being held at the Royal College of Nursing, Henrietta Place, London, W.1, at the request of the public-health section, to discuss with representatives of national and voluntary bodies immediate and economic ways of helping the aged and infirm in their own homes.

M.R.C. Committee on Analgesia

Following a recommendation in the report of the Working Party on Midwives, the Medical Research Council has set up a committee to promote research into analgesia suitable for use by midwives. The chairman is Sir William Gilliatt, F.R.C.O.G., and the secretary, Dr. G. S. W. Organe, anæsthetist to Westminster Hospital, who is already secretary of the Council's anæsthetics committee. The new committee's terms of reference will include the study, if thought desirable, of modified methods of administering existing analgesic agents as well as the initiation of further research for new agents. At the present time the Central Midwives Board, advised by the Royal College of Obstetricians and Gynæcologists, approve the use of five types of gas-and-air machine by midwives specially trained in this method.

Extra Soap

The Ministry of Food announces that bedridden patients who suffer also from a condition for which extra soap is granted, may now receive both the one extra ration of soap to which they are entitled because they are bedridden and the special allowance of soap appropriate to their condition. Doctors are asked, when authorising extra soap for the bedridden, to write the word "bedridden" on form R.G.50 without quoting the classification for this condition in Med. 2. If a bedridden patient also qualifies for soap under another classification in Med. 2, that classification should be quoted and the word "bedridden" added. Patients whose condition requires the liberal application of ointments, pastes, or similar preparations already qualify for one extra soap ration per week on presentation of a medical certificate at the local food office.

CORRIGENDUM: *Royal College of Physicians of London.*—The list of elections to the fellowship issued by the college last week contained the name of Dr. Ronald Arthur Jones (Suffolk). The new fellow is Dr. R. A. Jones of Ipswich, and not (as inadvertently stated on p. 805 of our last issue) Dr. R. A. Jones of Newmarket, who is a member of shorter standing. We much regret this confusion of names and the inconvenience it has caused.

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MAY 21, 1949 PAGES 849 TO 894

THE LANCET

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THE NATURAL HISTORY OF POLIOMYELITIS *

B. W. LACEY
M.B., B.Sc. Lond.
BACTERIOLOGIST, WESTMINSTER HOSPITAL AND MEDICAL SCHOOL, LONDON

THE incidence of poliomyelitis in Great Britain in 1948 was less than a quarter of that in 1947. Though events have thus followed the rule, there seems to be little doubt that this country can now be numbered among those, of temperate climate and considerable standards of hygiene, where poliomyelitis can be expected to recur with increasing incidence, and where persons in their fourth or even fifth decade cannot assume themselves to be immune. This may therefore be a suitable time to survey briefly the natural history of the disease.

The causation of poliomyelitis is almost as complex as that of new growths: in both we find many more or less established causes involved. The difficulty in both is not so much to enumerate these causes as to relate them in proper sequence, to identify the mechanism involved, and to give each its due importance. Here it is intended only to fuse the literature into something short enough to be readily comprehended, and with only sufficient detail to provide a basis of understanding. But with so much written, so many apparent factors, and so much conflict of opinion, such a review must be extremely compressed and appear far more dogmatic than it should.

ORIGIN

The origin of poliomyelitis is not known. There is some evidence that it may have existed in Egypt in the 18th dynasty (1580–1350 B.C.) [130]; but, though sporadic cases may have appeared during all historical time, it is certain that epidemics first arose about a hundred years ago, and that from a small beginning they have recurred with increasing magnitude ever since.[55] That a virus is the essential cause is not seriously challenged, but how such virus came only recently to cause epidemics is not clear. Diseases closely resembling poliomyelitis in clinical features and pathology occur naturally in mice (Theiler's encephalomyelitis [298 299]) and pigs (Teschen disease [78 114]) and are caused by a virus of similar size, and, in the case of the mouse, one which may be immunologically related to some strains of human virus.[76] Burnet [55] reservedly suggests that the mouse and human viruses may have a common ancestor by whose mutation a strain of new and epidemic pathogenicity may have arisen. This is stimulating but neither acceptable nor deniable. Moreover it seems that, though occasional epidemics at present may follow contact with a strange (non-endemic) strain, either by importation of the strain or by migration of the community, most are largely due to rising standards of sanitation preventing the hitherto normal immunisation of infants by endemic viruses, thus creating a general susceptibility of the community needing only an inoculation for an epidemic to flourish.

NATURE OF THE VIRUS

Up to now the virus of human poliomyelitis has been most elusive. Ultrafiltration and centrifugation have established its size as 15–25 mμ in at least one diameter [86 200]; it is thus the smallest living organism known to infect man. Determination of its shape has been hampered by the difficulty of obtaining a concentrated preparation free from lipoid material. In tissue culture the virus has been grown only in the presence of nerve tissue,[275] while in the chicken embryo, though one strain has recently been passaged up to 14 times,[283] no satisfactory growth has been obtained. With neither of these two usual sources of material available, all preparations have had to be made from fæces or infected nervous tissue. Electron micrographs, of ultracentrifuged deposits of etherised extracts of fæces of poliomyelitis patients, have shown bodies about 15 × 115 mμ which are associated with activity.[114] But inactive bodies of identical shape can be detected in the fæces of normal people, and thus their significance is doubtful.[218] Moreover, the Lansing strain of human poliomyelitis (isolated from the brain of a patient with bulbar poliomyelitis dying in Lansing, Michigan, in 1939,[8] has recently been examined [122 201] with the electron microscope after shadowing with metallic chromium to give a three-dimensional effect according to the technique of Williams and Wyckoff.[338] It appears to be a spherical or slightly asymmetric particle about 25 mμ in diameter. Whatever the true shape of human virus proves to be, it seems clear that one member of the poliomyelitis group—the virus of Theiler's mouse encephalomyelitis—is about 14 × 115 mμ in size. It is thus outstanding among animal and bacterial viruses in having a shape which is not a short rod, like vaccinia,[287] or that of a tadpole, like the virus of Newcastle disease of chickens [21] and the T_2 *Bact. coli* phage,[287] or a sphere, like most animal viruses, but one resembling the needle shape of many plant viruses, of which tobacco mosaic is the classical example.

RESERVOIR

So far no living reservoir other than man has been found. The animals of man's normal environment, including calves, cats, chickens, dogs, goats, horses, pigeons, pigs, and sheep, have all been considered insusceptible to human virus,[164] Recently, however, mice have been infected from human fæces and spinal cord when sterile autolysed human brain, from a fatal bulbar infection, was added to the inoculum.[231] It is therefore conceivable that human virus may yet prove transmissible to some domestic animals. Nevertheless there is no evidence of any of them carrying the virus naturally, nor has the virus been detected in their fæces.[256] No poliomyelitis virus has been found in wild rats,[48] or in mice, cats, chickens, cows, hogs, and musk-rats,[108] or in certain fishes from waters polluted with infected fæces,[280 312] or in birds near polluted water,[221] or in sewage flies, or in the fæces of swallows feeding on flies in the neighbourhood of sewage,[239] or in cockroaches, ants, and mosquitoes near paralysed patients.[255 256] During epidemics, flies (musca, phœnicia, and phormia) caught both in and away from poliomyelitis districts have been found carrying virus but without evidence of its multiplication.[268] In the laboratory, however, blowflies of the genus phormia have produced virus in their excreta as long as three weeks after feeding on fæces from a human case.[224] Virus is known to retain activity outside the body up to at least 90 days in the cold in butter [178] and in water,[62] and even 200 days in fæces [208]; but, though often found in raw sewage during epidemics, and traceable as far as humus-tank effluent,[239] it has not so far been detected before outbreaks.

At times the activity of raw sewage has been high enough to suggest either that 6% or more of the population was excreting virus [220] or that multiplication had occurred outside the body.[179] But among a moderate range of bacteria and protozoa none has been found which will propagate poliomyelitis viruses.[53 68] The possibilities of earthworms, slugs, frogs, plants other than the tomato,[309] and plant parasites remain to be explored.[22] In effect, therefore, there is no known reservoir apart from man, nor any necessity to postulate a reservoir so long as the interval between sporadic cases in the winter is less than 4 months.

* Based on part of a symposium on poliomyelitis held at Westminster Medical School in September, 1947.

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SOURCE OF INFECTION

No virus has been found in the urine, saliva, or salivary glands [278 279]; hence only nasal secretions, pharyngeal secretions, and fæces have to be considered as sources. It is unlikely that nasal secretions are often concerned, because the seasons of poliomyelitis and upper respiratory-tract infection do not coincide, and because sneezing in poliomyelitis is rare. But the importance of the other two is now undoubted.

From the pharynx virus has been recovered from swabs, tissues, or washings (1) of up to 43% of cases during the first few days of illness,[141 155] exactly the days during which persons in some outbreaks have appeared to be most infective [14 64]; (2) from 5 or 6 days before [123 297] to 14 days and possibly longer after the onset [255]; and (3) of healthy carriers.[154 171] As Sabin [274] points out, however, it is notable that, though virus can be discharged from the mouth during blowing or spitting,[326] it was not recovered, in one experiment, from the masks of five early severe paralytic patients who for 30 minutes had talked, coughed, spat, and blown into them.

Virus has been found in the fæces (1) of virtually all patients, when an adequate technique has been used; (2) of contacts, with a frequency proportional to their intimacy,[208 255 257] though generally less in adults [49 185 330] and not always continuously [49]; (3) for a median period of 3 weeks,[143] from 19 days before the onset of paralysis [50] to 123 days after an abortive illness [190]; (4) in daily amounts equivalent weight for weight with that in the spinal cord [87]; (5) with such an activity at times that 10 mg. of a wet specimen may be infective for monkeys when inoculated into the brain [220]; and (6) sufficient readily to infect monkeys by intranasal inoculation [147 317] and chimpanzees by mouth, nose, or stomach.[146 220]

It is clear that these two potential sources (fæces and pharyngeal secretions) are not mutually exclusive; but their relative importance cannot be determined at present [14]; more direct surveys are needed of pharyngeal and fæcal carrier-rates both in and out of frankly epidemic times. Nevertheless, it seems likely that pharyngeal secretions will prove to be the source of most contact infection, even though fæces may be the chief source of virus in non-contact infection, subclinical immunisation, or perpetuation of epidemics.

MODE OF TRANSMISSION

Until ten years ago only a few doubted that man was always infected by inhalation of droplets or droplet nuclei. For it was clear that rhesus monkeys were resistant to virus given by mouth and might excrete it without evidence of infection, whereas, in contrast, intranasal inoculation regularly led to infection, the virus passing via the olfactory nerves, bulbs, and thalamus to the cord.[33] But with the increasing proof of the susceptibility of the chimpanzee and the cynomolgus monkey *Macaca irus* to oral infection, and with the increasing evidence of virus in human fæces, opinion generally has emphasised the rôle of fæces in transmission. Yet in many recent epidemics observers have considered virus to be transmitted largely by droplets.[268] In outbreaks in the U.S.A. in 1941 and 1945 careful investigation indicated that the most important factor was close personal contact involving hugging, playing, and kissing, from a few days before to a few days after the onset of paralysis.[66] In several instances there was a clear history of only a few hours' or even minutes' contact, and for children of $1^1/_2$–$3^1/_2$ years the disease seems at times to be as contagious as measles or mumps.[66] With the recognition of a high ratio of non-paralytic to paralytic disease, the impossibility of always showing a case-to-case contact, and the apparent lack of secondary infection, ceased to be legitimate objections to such a view. Nor does the acceptance of this mode exclude the possibility of communal infection from a common source—a possibility which seems to explain best some family outbreaks.[49 332 345]

Flies

At present there is no direct evidence that flies play any part in human disease. Initial trials of anti-fly measures have shown no effect,[225] but the conditions were not optimal; and, since flies may probably convey enough virus to food to infect chimpanzees,[325] they must continue to be regarded as potential vectors wherever fæcal matter is exposed, not only in primitive sanitation of a national or railway kind but also with even the most modern apparatus. There is similarly, as yet, no evidence to incriminate sewage. No geographical association of cases with exposed sewage has been recorded, and it thus seems improbable that virus is secondarily conveyed by flies, especially the true sewage flies, which, except anisopus, are not known to lay eggs in houses. With most drainage systems, moreover, only rats in sewers or flies at sewage works or outfalls are likely to have access to infective material.

Food

Whether or not flies prove to be important, it seems certain that food may be a vehicle, and this mode of transmission could explain the peculiar incidence of poliomyelitis (and of infective hepatitis) among the Middle East and Indian Forces during the war. The incidence of both diseases among other ranks was only a quarter or a fifth of that among officers [206 292]; but other ranks had British or strictly supervised native cooks, whereas officers employed natives with little supervision and had by far the dirtier kitchens. In a few epidemics infection has most probably been spread by milk,[9 121 210] and mouse strains of virus in milk may survive pasteurisation.[187]

Water

Occasionally water has been suspected of carrying virus, for in several outbreaks cases have seemed to follow a watercourse.[175 213 253] Strains vary in their resistance to chlorine,[318] and it is probable that, when much organic matter is present, the virus is not always killed by the usual amounts of chlorine used.[314] But, though the possibility has to be admitted, transmission by drinking-water or swimming-baths has never been proven.

Parasites

That a blood-sucking arthropod might carry the virus from skin to skin or blood to blood has often been considered. It is certainly not a fantastic idea when four neurotropic viruses are known to be, and a fifth is suspected of being, transmitted by mosquitoes, mites, ticks, or a combination of these.[269] But neither lice nor bedbugs will transmit the virus in experiments [145]; the disease is not associated with filth or poverty and it occurs in winter [164] when other insect-borne virus diseases of the nervous sytem do not; and the virus has only recently been found in human blood, and then only in one of over a hundred cases during the first week of illness.[324]

Inoculation

There remains the possibility of infection by inoculation. Twelve cases of paralysis have almost certainly been caused by subcutaneous or intramuscular inoculation of poliomyelitis vaccines.[188] There are also records of persons developing poliomyelitis while working in the laboratory, usually with recently isolated strains.[117 276 331] In one [331] there was a history of skin trauma but without unequivocal evidence of infection by the trauma.

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In sum, the way virus is transmitted probably varies both within and between epidemics. In some epidemics personal contact appears to be the mode, in others fæcal contamination of food. Flies and sewage are potential but unproven agents. These probable and potential modes are represented in fig. 1.

PORTAL AND ROUTE OF INVASION

When paralysis has followed trauma—e.g., vaccination, adenoidectomy, tonsillectomy, or skin wound—it seems highly probable that the virus has passed up the exposed afferent fibres to their pseudo-unipolar cells in the corresponding sensory cranial nerve or posterior spinal-root ganglion and thence to neighbouring motor neurones. Thus by far the greatest number of the many cases of poliomyelitis following recent tonsillectomy have been of bulbar type[85 119]; and, where the sequence is known, paralysis following inoculation of poliomyelitis vaccine has always developed first in the same or in the contralateral limb.[186] Similarly, in the monkey, paralysis following inoculation of virus is more often of bulbar type after tonsillar injections than after injections elsewhere.[271] In the monkey also, virus can travel along a nerve at a rate of 2·4 mm. an hour,[35] provided the axons themselves are intact[34]; whether by diffusion or other means is unknown.[34 311] Tobacco mosaic virus has been tagged with radioactive phosphorus without apparently affecting its virulence[196]; if it proves possible to treat poliomyelitis virus in the same way, the exact mode of travel may be finally determined.

Apart from traumatic cases, the path by which virus reaches the central nervous system in man is usually as obscure as the mode of infection in the first place. The consensus now seems to be that the route via the olfactory tract, amply demonstrated in rhesus monkeys ten years ago, can no longer be accepted as an inevitable, or even more than a possible, route in man. Not only are droplet nuclei seldom implicated as a source, but examination of the olfactory mucosa and olfactory bulbs at necropsy on human cases has only occasionally revealed virus or evidence of invasion.[29 151 172] Chimpanzees have even been infected by oral administration after section of their olfactory nerves.[150] In contrast, the evidence in favour of entry by the pharynx or intestine, first suggested in 1898,[54] is very considerable. When carefully looked for, virus has been isolated from one or more places along the alimentary tract in almost every case, and, at different times, from all sites except the œsophagus and stomach.[273] The appearance of virus in the gut probably follows multiplication in the epithelial cells or possibly nerves,[153] though it may only represent excretion.[93]

The Lansing strain is inactivated in 15 minutes at pH 1·5, the average acidity of gastric juice[90]; but, like typhoid bacilli and other organisms sensitive to acid, it survives presumably because the stomach begins to empty within a few minutes of ingestion. Milk raises the pH[19] and thus may predispose to infection from the intestine.

Some workers have emphasised the significance of the not infrequent histological changes in the Peyer's patches and mesenteric lymph-nodes,[127 254] and the occasional isolation of virus from these,[103 176] by suggesting that the usual route of invasion is via the lymphatics.[58 116] But the consensus favours a nervous route. There is reason to believe that virus may extend along sympathetic fibres at least as far as their postganglionic cell body; for cyanosis, sweating, and disturbances of micturition may develop before skeletal paralysis,[305] and occasionally at necropsy sympathetic ganglia may show evidence of invasion or contain virus.[77 91 272] Probably both sensory and motor fibres can transmit virus[153]; but, after inoculation of mixed nerves, lesions are first found in the spinal ganglia,[260] and on the whole the evidence suggests that virus usually travels by visceral afferents. Certainly the ganglia of the fifth, ninth, and tenth cranial nerves, carrying afferents from the pharynx, and often also the posterior nerve-root ganglia, particularly those of segments where the anterior or lateral horns are involved, have shown signs of invasion in most human cases where the findings have been recorded.[29 91 254 272] Bodian and Howe[38] consider that no deduction is permissible from existing data. Faber and Silverberg[91] suggest that cranial ganglia are invaded centripetally and spinal ganglia centrifugally. For the moment, however, it seems justifiable to assume that any ganglion is normally invaded centripetally during the course of infection of the central nervous system, whether or not any lesion remains, and whether or not it subsequently becomes affected by centrifugal spread. It is generally accepted that visceral afferent fibres from the intestines, originating in either muscle or mucosa, run in the sympathetic nerves, through a mesenteric or the cœliac ganglion, sympathetic chain, and white rami, to their cells in the posterior-root ganglion.[265 289] Thence, with no synapse having intervened, they connect directly with lateral-horn cells or, via one internuncial neurone, with anterior-horn cells. It is conceivable, moreover, that some fibres ordinarily conveying visceromotor reflexes[230] may resemble skeletal muscle afferents and synapse directly with anterior-horn cells in a two-neurone arc.[200]

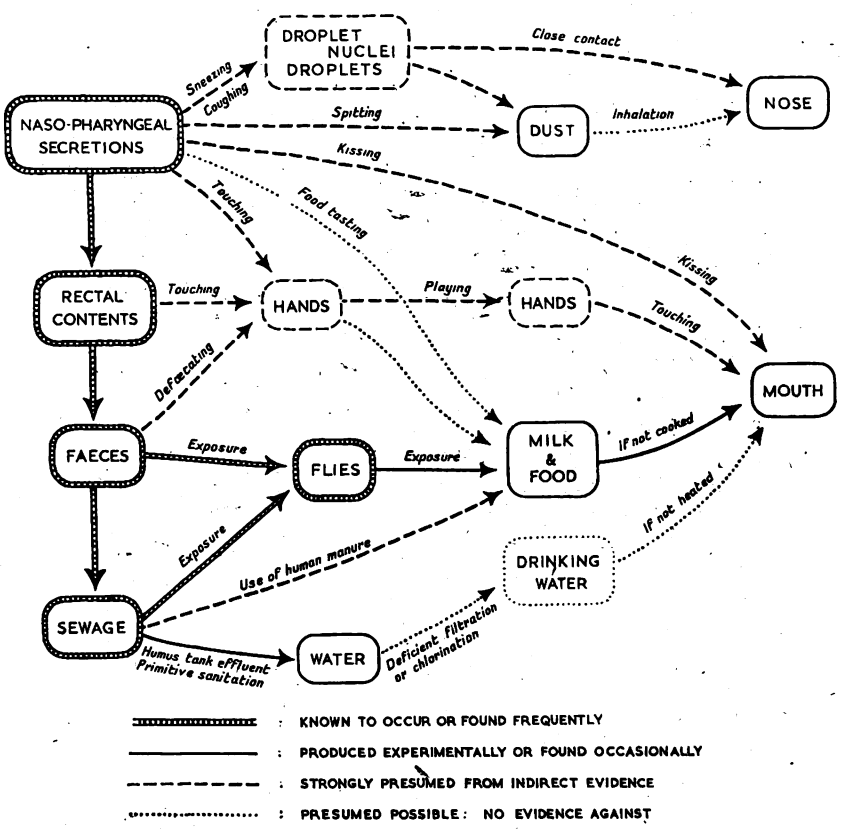

Fig. 1—Sources, vehicles, and modes of transmission of poliomyelitis virus, showing degrees of frequency or probability (see key).

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Whatever the exact route is, if the progress of virus is determined more by anatomical connexions than by its own selectivity, initial paralysis should develop in those muscles most closely connected and integrated with the afferents conveying virus from its portal. In cases following trauma this is so; in others the present data are insufficient for certainty. Experimentally virus can travel up or down intact nerves in both the cord [46] and the sympathetic chains [148 306]; but, when in man paralysis develops in several places at once, it is not known whether it has followed either of these routes or has merely entered by several portals. Apart from trauma, previous tonsillectomy is the only factor known which appears to favour invasion by a particular route; for, though the total incidence of paralysis is the same in persons with and without tonsils, the frequency of bulbar involvement is significantly greater in the latter.[12 342] In contrast, exposed dental pulp may slightly predispose to infection [2 3 59] but not to paralysis of bulbar type.[95] The portals and routes of infection are summarised in fig. 2.

FATE OF VIRUS IN CENTRAL NERVOUS SYSTEM

With the onset of paralysis acidophil intranuclear inclusions appear regularly in the neurones of monkeys [72 144 160] and have been reported in the neuroglia of man.[39] But, though *infection* of all types of cell in the central nervous system may be the rule, and though virus and histological changes are widespread in both monkeys [39 94] and man,[29 203] the distribution of pronounced lesions found post mortem in man [29 272 295] indicates that *multiplication* is almost restricted to certain cells—the motor neurones of the anterior and lateral horns, the proprioceptive neurones of cranial and spinal ganglia and their relay or motor cells in the vestibular nuclei, the roof nuclei of the cerebellum, and the reticular formation in the floor of the fourth ventricle. There is no generally accepted explanation for this peculiar distribution. Viruses are usually associated with young or actively multiplying cells, possibly because such cells are most easily invaded, or more probably because in these the virus finds its optimal milieu; yet neurones are as old as the body and incapable of division. But not only is poliomyelitis virus probably the smallest living agent pathogenic to man, and presumably, therefore, maximally dependent on its environment,[182] but the cells in which it specially thrives are also exceptional in having the largest volume—even excluding the axon—the most extensive surface area, and the greatest length, of any in the body.[163]

It is therefore conceivable that the anterior-horn cells are suited for multiplication of virus, not owing to their rôle as relays of nerve impulses, nor directly to their maximal blood-supply, as some [254 259] have suggested, but to the constant and very great activity associated with the maintenance of axons [30] whose volume may be 1000 times that of the cell body.[163] Such exclusiveness is not unique, for a similar selectivity may be shown by louping-ill virus for Purkinje cells,[161] and by the virus of foot-and-mouth disease for oral epithelium.[112]

It is well known that quite small changes may localise proliferation of the virus. In a guineapig inoculated with the virus of foot-and-mouth disease the mere wrapping of a foot in cotton-wool will prevent the normal appearance of vesicles on the sole.[211] It is tempting to believe that trauma may have a comparable action in poliomyelitis through an effect on the anterior-horn cells, for there are at least eighteen cases mentioned where a fracture [110 214 242 293 344] or other injury [250 286] has been followed in 1–12 weeks by a monoplegia confined to the injured limb.

Muscular effort in the preparalytic stage may also have a localising effect [296 319]; but there is no explanation at present for the incidence of paralysis of the legs being about $2^1/_2$ times that of the arms, or for the special frequency with which the anterior tibial, peroneal, deltoid, and external rectus muscles are affected.[52 334] In most twins there has been no significant localisation,[40 136 157] though the simultaneous occurrence of mirror-image paralysis in monochorionic twins aged 3 months has been reported.[226]

Exactly how the virus affects its host cell is unknown. Experiments with mice designed to test the effect of virus on anaerobic glycolysis have yielded conflicting results.[263 339] In monkeys the Nissl granules disappear as the concentration of virus rises.[30] This concurrence may represent multiplication of virus at the expense of Nissl-substance nucleoprotein [184] because, though its chemical constitution has not been determined,[28] the virus of poliomyelitis is likely to resemble viruses in general and thus to be composed largely of nucleoprotein. Yet this concurrence may finally prove to be no more than a non-specific reaction to a toxin of the virus, since it seems that some viruses at least, such as that of lymphogranuloma venereum, may form an endotoxin.[264] In monkeys the amount of virus developed is proportional to the final degree of nerve-cell degeneration [94] and reaches a maximum from 48 hours before to 24 hours after the onset of paralysis.[32] By this time it is usually obvious whether or not a particular cell will die,[159] and over 90% of virus activity may be found in portions of the grey matter forming only 25% of the total weight of brain and cord.[44] Such gross (33 : 1) localisation of infection in the grey

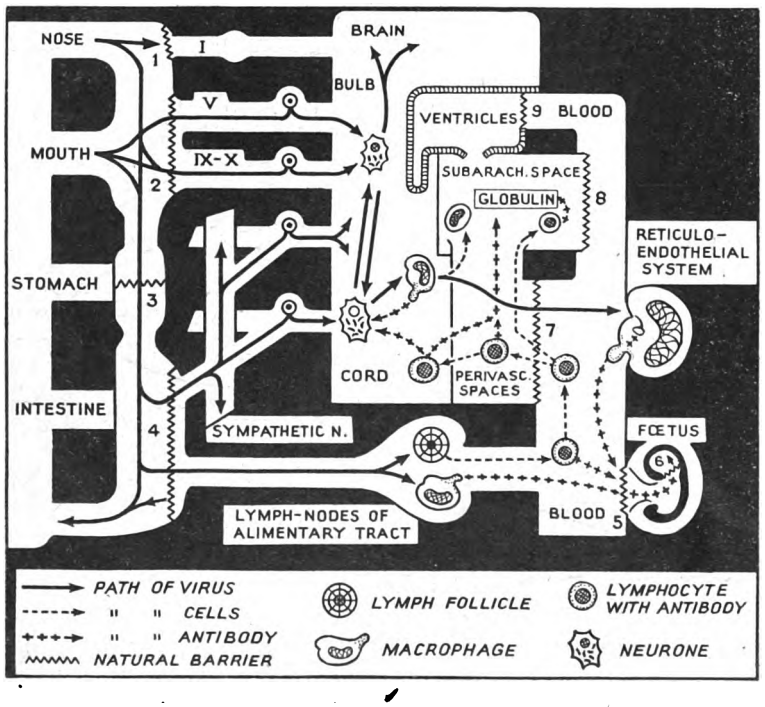

Fig. 2—Routes of invasion by, and development of specific immunity to, poliomyelitis virus. Natural barriers: (1) olfactory mucosa; (2) oropharyngeal mucosa; (3) gastric juice; (4) intestinal mucosa; (5) placenta; (6) fœtal blood-C.N.S. barrier; (7) blood-C.N.S. barrier (cerebral and spinal capillaries); (8) arachnoid villi and spinal veins; (9) choroid plexuses.

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(πολιός) matter is responsible for the naming of the disease by Kussmaul in 1874.[109]

The concentration of the virus rapidly diminishes after paralysis.[32] At one month it is not usually detectable,[44] and the cells remaining have mostly regained their normal appearance.[29] The ultimate fate of the virus is uncertain. By analogy with bacteria it seems likely that in cells which die it is removed with cell debris by the microglia-turned-macrophage, to be disposed of by the fixed reticulo-endothelial cells possibly by being excreted in the fæces. All agree that it does not appear in the cerebro-spinal fluid (c.s.f.). In this way it resembles rabies virus and differs from the viruses of lymphocytic choriomeningitis, mumps meningo-encephalitis, and Venezuelan equine encephalomyelitis, which are usually or often detectable, and from the eight or nine other viruses causing encephalitis, all of which may be found in the c.s.f.[269] In cells which recover, the virus may be destroyed by the cell or undergo autolysis, but in animals it may only be obscured by the presence of inhibitors[115] or by neutralising antibodies, from which it can be separated by electrophoresis.[248] Hence it seems possible that virus may remain dormant in clinically unaffected cells and be responsible for a metastable state needing only the occurrence of favourable conditions inside the cell to allow rapid multiplication and the almost immediate onset of paralysis.[273] Certain physiological conditions in the neurones might thus be to poliomyelitis virus what a traumatised state is to herpes virus, or a low reduction oxidation potential to tetanus spores. Metastable conditions of this kind are probably inducible. In recent experiments, Swiss mice, inoculated with Lansing virus have survived unparalysed if kept, before and after inoculation, on a diet deficient in aneurin. But about a quarter of the survivors of one group became paralysed within two weeks of being given a full diet.[266] In monkeys the recovery of virus from non-paralysed animals 35 days after inoculation[277] points in the same direction. In man the occurrence of metastable conditions is suggested by the occasional but dramatic onset of paralysis within 12 hours of strenuous exertion.[50 193]

To summarise we might say that the virus is neurocytophilic rather than neurotropic, affects predominantly efferent neurones concerned in posture, and can kill the cell, be killed by the cell, or persist in a static phase awaiting suitable conditions for multiplying.

NATURAL RESISTANCE

After sixty years' experiment and discussion the causation of poliomyelitis is still an unsolved and fascinating puzzle. It seems fairly clear that man plays an essential part in the life-history of the virus, and in general suffers in the process either a pandemic of widespread infection with little disease or an epidemic of geographically localised infection in which over 1% of the population may be attacked.[186] Beyond this ecological aspect, however, many problems of current interest remain, especially the increasing incidence, the increasing involvement of older people, the association with high standards of sanitation and temperate climates, and the predominant occurrence during July, August, and September in the northern hemisphere, or their equivalent, January, February, and March, in the southern hemisphere. For each of these, numerous explanations have been offered, all in essence emphasising the importance of a single change or a combination of changes in pathogenicity of the organism, efficiency of transmission, or resistance of the host—factors which are of major concern in all infections, and all of which in the final analysis can be assumed to be involved in every case.

Strains of virus from different sources or of different experimental histories undoubtedly differ in virulence[102 174 311] and infectivity for a given route[272 316] besides antigenic structure[57 252] and perhaps antigenicity.[173] There is also no question that the efficiency of transmission may vary, and, by affecting the size of infecting dose, the rate of its reception,[88] or the area of infectivity, influence the onset or course of an epidemic. Yet there is an increasing number of indications that host resistance is the factor of most import, and that, while this resistance depends in part on the natural barriers and in part on immunity acquired by previous contact with the virus, it is influenced also, and perhaps chiefly, by the physiological state of the neurones.[26 36 149] In monkeys the importance of this state is suggested by evidence of (1) a very high resistance of the anterior-horn cell during chromatolysis following axon section[36]; (2) an increased incidence of paralysis during the summer, occurring with virus inoculated intracerebrally[233]; (3) an increased resistance to virus when the host is chronically deficient in folic acid[197]; (4) a resistance apparently acquired as the result of residence in a temperate climate[191]; and (5) both increased incidence[193] and severity[193 296] of paralysis following fatigue or chilling during the incubation period. In mice acute aneurin deficiency may reduce the incidence of paralysis from 80 to 15%,[266] and a reduced potassium or phosphorus intake seems to have a similar but less effect.[198] In man the incidence of paralysis has been (1) maximal in young adults in epidemics among virgin-soil populations[125 238]; (2) twice as great during the last three months of pregnancy as during the first six months[107 124 322]; (3) greater in males of all ages and all populations with an average ratio of males to females of about 1·3 : 1[70 104]; (4) slightly greater in legitimate children, and between wars[26]; (5) probably slightly greater in pregnancy (the three hundred or so cases recorded have not been controlled, and their interpretation is difficult[13 42 107]); and (6) possibly slightly greater in heavier children[10] and in persons with a particular recessive gene,[1] fair hair,[194 204] or of mongoloid or subendocrinopathic type characterised by a tendency to growth without corresponding development, hypogonadism, and various stigmata.[81 192 301] Increased severity is undoubtedly associated with pregnancy,[107 124 322] exertion,[270 319] and perhaps also with obesity.[238] The lethality, even when differences in reporting have been considered, is maximal between the ages of 20 and 45 years.[26 243 334]

All these observations combine to suggest that virus of a sufficient pathogenicity is always more or less present in the environment and infecting persons, but is unable to produce paralysis unless conditions in the enteroceptive and motor neurones are favourable to rapid multiplication.

Host resistance also depends largely on the natural barriers forming the static defences of the body against invasion. In the monkey the skin is probably impermeable to poliomyelitis virus[183 189]; but, though the nasal mucosa is infectible in all species, the intestinal mucosa forms a barrier of widely different value even among those closely related, being highly effective in rhesus monkeys but readily overwhelmed in cynomolgus monkeys and chimpanzees. In the rhesus monkey a good resistance to intranasal inoculation can be produced by the local application of zinc sulphate or other solutions.[284] In man mucosal resistance is largely an unknown quantity. The apparent rarity with which virus invades by the olfactory nerves makes it probable that the olfactory mucosa has a considerable natural resistance, and it is not surprising that a thorough clinical trial of zinc sulphate sprayed into the nose showed no evidence of protection.[303] Mucosal resistance is almost certainly reduced by trauma, for the incidence of poliomyelitis in recently tonsillectomised children may be several times greater than in the general child population.[6 12] But the suggestion[215] that the reduction of mucosal resistance by summer infections might explain the seasonal incidence

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of poliomyelitis is not easily reconciled with the absence of strict association of the diseases in either place or time.[26 228]

Between the mucosæ and the blood the lymph-nodes probably form an effective barrier. Virus has occasionally been found in the nodes [103 180] but only two or three times in the blood. In some epidemics the lymphatic system is prominently involved [127] and at times may even appear to bear the brunt of the disease.[58]

The fact that in monkeys the dose needed to infect by the blood may be over 1000 times that needed by the intracerebral route [99] makes it unlikely that any virus entering the blood would penetrate further towards the neurones. Part of this resistance probably results from the normal clearing action of the leucocytes and reticulo-endothelial system; for virus is recoverable after intravenous inoculation from bone-marrow and spleen.[99] Part also is attributable to dilution in tissue fluids and adsorption to cells. Most, however, is almost certainly due to the intrinsic nature of the tissues separating the blood from (1) the C.S.F. surrounding the choroid plexus and leptomeningeal vessels (blood-C.S.F. barrier [323]), and (2) nerve tissues of brain, cord, and peripheral nerves (blood-brain barrier [111 291]). The absence of a significant C.S.F.-brain barrier [323] in the monkey is shown by the ease with which infection is induced by intrathecal inoculation.[162] The importance of the blood-C.S.F. barrier is therefore clearly proved by the reduction of the intravenously effective dose of virus which follows its trauma by an intrathecal injection of normal serum.[100] The blood-brain barrier seems to be the endothelium of the capillaries of the central nervous system. This endothelium differs from that of other vessels by its impermeability to negatively charged particles,[111] and thus to poliomyelitis virus [248] and indeed all viruses except those with relatively no charge, such as fowl plague,[304] and those which grow through, as may the virus of western equine encephalomyelitis.[111]

Infection in utero is unknown; but, since the virus very rarely appears in the blood, the placenta may well be as permeable to the virus of poliomyelitis as it is to *Treponema pallida*, *Trypanosoma gambiense*, toxoplasma, *Brucella abortus*, and the viruses of smallpox, chickenpox, measles, and mumps.

SPECIFIC IMMUNITY

Poliomyelitis clearly belongs with tuberculosis and diphtheria to a group of infections in which natural host resistance plays a highly important or even predominant part; but it does not follow that specific immunity is negligible. The occurrence of specific immunity has often been questioned, chiefly because specific antibodies have been found only irregularly in the serum, and recently because, unlike known immunising infections, poliomyelitis did not show an age precession in Sweden between 1911 and 1939.[26] Yet the assumption of a specific immunity in poliomyelitis appears justifiable both because, a priori, it is reasonable to assume the normal unless disproved and because it makes intelligible many facts for which there is otherwise no convincing explanation.

Thus, increased immunity due to a naturally accumulated exposure with increasing age is seen to underlie the increased ratio of non-paralytic to paralytic cases in older age-groups [126 251] and be reflected in the increase of mean serum antibodies with increasing age.[47 131] Conversely, a decreased immunisation due to decreased exposure, due to a higher or rising standard of sanitation, is, or could be, held responsible for (1) the increasing frequency and size of epidemics [55]; (2) the increasing incidence in older age-groups in all parts of the world [26 139 329]; (3) the relatively increased mortality in older ages between 1910 and 1940 [118]; (4) the higher incidence in Schick-positive people [165 243]; and (5) the higher incidence and higher age-incidence in northern U.S.A.[243] Similarly, a lack of specific immunity due to a lack of previous exposure to an endemic virus could, or is believed to, explain (1) the much higher incidence among nurses from other States in the outbreak in Southern California of 1934 [246]; (2) the appearance of poliomyelitis among adult British troops in Malta during the 1942 epidemic, in which very few adults but many children of the native population were affected [285]; and (3) the high incidence of poliomyelitis in American troops in the Far East [274] and British troops in India [206] at a time when only sporadic cases were occurring among the native children. Finally, the supposition of a specific herd immunity acquired from an epidemic readily accounts both for the subsequent comparative freedom of an affected family or community in spite of the usual recurrence of epidemics in the locality, and for the observation that the duration of freedom is proportional to the severity of the preceding attack.[333 335]

In monkeys and chimpanzees the immunity which follows experimental infection is never absolute [98]; it can always be ruptured, given sufficient virulence and dose of virus.[308] As would be expected, it wanes with time, varies directly with the severity of the initial attack,[233] and, when other factors are kept constant, is most effective against the same strain and when challenged by the same route.[152 222] On both epidemiological and experimental grounds, therefore, we may conclude that specific immunity not only occurs but also plays a considerable part in host and herd resistance.

The mechanism of this immunity is far from being established. It appears probable, however, that a fairly localised immunity both at the periphery and at the centre may follow in the wake of infection, and that specific immunity depends more on this process than on the formation of serum antibody.

Peripheral Immunity

It is conceivable that persistence of virus or virus-antibody complex in the cells of the mucosæ or afferent neurones might produce a temporary local specific immunity of any portal in the way that the presence of a virus often produces a cellular resistance to further infection by related viruses.[237] In the central nervous system interference of this kind between strains of poliomyelitis virus has been recognised both in monkeys [166 168] and in hamsters.[75] Similar interference in afferent neurones has been suggested as the mechanism of resistance to reinfection shown by cynomolgus monkeys, on the ground that isolated changes in the cranial-nerve ganglia, probably due to previous infection, have been found at necropsy in resistant animals.[92] Other recent experimental work points to the occurrence of peripheral immunity. In the chimpanzee a subclinical infection, with transient presence of virus in the fæces, can be induced by giving virus by mouth.[222] Strain-specific antibodies appear in the serum, and a strain-specific resistance, confined to oral challenge, is developed.

But the mere lack of clinical symptoms after an oral challenge is not proof that the virus has been halted, either at the mucosa or in the peripheral nervous system, for widespread histological evidence of invasion of the central nervous system has been found in chimpanzees killed during subclinical infection.[37]

In man the only evidence pointing to a peripheral specific immunity is the apparent increase of subclinical infection with increasing age.[126 251] Here too, however, lack of symptoms referable to the central nervous system does not inevitably mean lack of invasion of that system. From a study of the close contacts in one outbreak it appears possible that the C.S.F.-protein level rises some time before the sixth week in about 80% of all infections, whether paralytic or non-paralytic.[5] Thus it may be that invasion of the central nervous system always follows

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peripheral infection, and that any peripheral immunity is due to an acquired resistance to infection and not to resistance to invasion after infection.

Serum Antibody

By analogy with other viruses [56 209] and bacteria [132] it seems likely that virus reaches the lymph-nodes draining the portal of entry and there stimulates the formation of antibody. Possibly the germinal centres are influenced to produce lymphocytes with cytoplasm largely of antibody globulin.[209] Possibly the reticulum cells are induced to form and bud off antibody into the efferent lymph.[281] Since lymphocyte cytoplasm also shows budding, or clasmatocytosis,[80] either mechanism could explain the antibodies which usually increase in the serum 3–21 days after the onset of disease.[15 177 315] The antibody is mainly globulin or a mixture of globulins [236 336] and hence does not pass through the choroid plexus or appear to any extent in the C.S.F. It is fully active only against its homologous strain.[11 294] It is of neutralising rather than of complement-fixing type and hence is not virucidal but forms a reversible,[248] and probably (as in vaccinia) a non-infective, association with virus.[7] It regularly enters the fœtus through the placenta,[16] and is detectable in the blood up to six months after birth.[320] The neural capillaries of the mouse fœtus are relatively more permeable than those of the adult mouse.[24 291] It is conceivable, therefore, that human maternal antibodies may reach the fœtal central nervous system and so account for passive immunity of the newborn. There is some evidence that serum antibody, if above a certain level, will pass into the nasopharyngeal secretions [25] and might thus aid mucosal resistance. Otherwise it has no apparent rôle in defence, either when of natural origin or when given in prophylaxis or treatment as whole serum [96 249] or gamma globulin.[20] It is noteworthy, however, that in monkeys intramuscular inoculation of living virus can induce an almost solid immunity against intracerebral challenge accompanied by a high titre of serum antibody.[235]

The demonstration in the serum of power to neutralise poliomyelitis virus is not by itself proof of immunity even to the same strain. Usually it will indicate previous contact and therefore, like a positive tuberculin reaction, an increased probability of an acquired immunity. But at times it may be of non-specific origin; pregnant mare's serum, for example, will neutralise virus.[167] Failure to find serum antibody excludes neither immunity nor previous infection, for (1) antibody may be present but not detected by the strains of virus used, (2) previous infection may have taken place without producing antibodies, or (3) protective substances of a type not yet discovered may be present.

Immunity of Central Nervous System

In contrast with serum antibody, antibody remaining in the lymphocytes may be of great importance. For the lymphocytes migrate, probably by their peculiar amœboid movement,[195] into the perivascular spaces of affected regions. Here most remain, while some continue into the neural substance and others are carried down the spaces to enter the subarachnoid space or to infiltrate the overlying meninges and form tell-tale patches of so-called meningitis.[159] In this way antibody may be released beyond the blood-brain barrier and where most needed.

A second conceivable source of local antibody is the microglia.[234] In monkeys at least, these cells may outnumber the lymphocytes near affected neurones [159] and, by appearing as macrophages, are generally regarded as part of the reticulo-endothelial system. Thus of both serum and central-nervous-system antibody there are two possible sources whose relative importance is unknown.

Recent experiments on monkeys have established the occurrence of local antibody.[234] Neutralising titres of up to 1 in 2000 have been found in the grey matter of affected zones while there was little or no antibody in the serum, C.S.F., or parts of the brain and cord without evidence of virus multiplication. The antibody appeared 11–16 days after the onset of paralysis and lasted at least 5 months. Its presence may explain the observation [153] that virus is halted at the convergence of a new afferent path with one recently invaded. According to Morgan [234] a similar local immunity of the central nervous system has been shown to develop in monkeys with yellow-fever virus,[106] in rabbits with herpes virus,[79 128] and in the mouse with its own encephalomyelitis virus.[115]

That some antibody develops locally in man also is suggested by the irregular detection of neutralising, complement-fixing, and virucidal properties in the C.S.F. of convalescents up to 18 months after paralysis.[181 229 245] But there is no direct evidence of a specific central nervous immunity. Some forty cases of second attacks of paralysis have been recorded.[43 73 97 129 199 244 337 341 343] In roughly a quarter of these the same limb has been twice paralysed, but no estimate is possible of how often paralysis has twice involved the same muscle group. The fact that a second attack of paralysis has possibly only twice [73 79] been observed to develop within a period of 3–24 months of the first certainly favours the existence of specific immunity but gives no hint of its mechanism. The incidence of second attacks, though very low, is probably no less than could be expected by chance.[43 97] It is therefore no evidence for an immunity anywhere. Neither does it weigh against an immunity, because the diagnosis has rarely been determined beyond doubt, and because the possible occurrence of an initial infection with a strain of poor immunising power, or of a recurrent infection with a strain of different antigenic structure, has not been investigated.

In sum, immunity almost certainly follows infection; there are indications that it may be due in part at least to persistence of antibody or virus in the central nervous system; and recognisable serum antibodies are associated with immunity but responsible only for passive immunity of the fœtus and young infant.

CLINICO-PATHOLOGICAL CORRELATION

Incubation Period

As a rule no estimate of the incubation period is possible. A study of thirty-seven cases occurring after a visit of less than 48 hours to a previous victim showed a range of 5–35 days, with a modal exposure-to-paralysis time of 14 days and two modal exposure-to-onset times of 7 and 14 days.[63] These times are probably as exact as any possible at present. They are supported by reviews [17 142] of numerous other estimates based on epidemiological data and poliomyelitis following tonsillectomy [12] or inoculation of poliomyelitis vaccine.[188] They also conform with the detection of virus in the fæces 19 days before paralysis [50] and the presumptive absence of virus in both fæces and nasopharynx 8 days before paralysis.[345] In monkeys the incubation period varies with the dose,[45] strain,[44] and history of strain [261]; it is increased by dilution of inoculum,[233] in cold weather,[233] and irregularly by hexamine.[101] It may be reduced by addition of bacterial filtrates [307] or autolysed brain tissue [231] to the inoculum, and is shortest after intrathecal inoculation.[223] In mice the incubation period is prolonged by aneurin deficiency,[105 265] acclimatisation to cooler conditions,[137] and administration of thyroid gland.[138] In monkeys and mice a longer incubation period is associated with a decreased incidence [265] or less severe disease,[45 233] recalling the similar association in tetanus [51] and suggesting the presence of a race between virus and antibody.

The pathology of the incubation period is not known. Virus may appear in the fæces of the chimpanzee within

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72 hours of oral [232] or subcutaneous [219] administration. If this is not due to excretion [93] it may, as Horstmann and Paul suggest,[142] indicate a rapid implantation of virus in the wall of the alimentary tract. The period between exposure and onset would then be the time taken by virus to multiply and produce sufficient toxin to cause fever, headache, listlessness, vomiting, sore throat, or diarrhœa, while it concurrently spread axonally at the rate of 2 or 3 in. a day to reach the central nervous system at, or shortly after, the first temperature hump.

Symptoms and Signs

Involvement of the autonomic nerves is suggested during the preparalytic stage by the occasional transient retention or difficulty in voiding urine [305 340] and later by the fact that paravertebral sympathetic block may relieve the localised cyanosis, sweating, or œdema which are prominent in some epidemics [127] and the muscular pains and tenderness whose onset often precedes paralysis.[262] Increased tone, exaggerated reflexes, extensor plantar response, and perhaps tremor are probably due to virus lesions in the motor cortex,[258 278] vestibular nuclei, and reticular formation [28] or other part of the extrapyramidal tracts. Ataxia is held to be due to involvement of cerebellar tracts.[156] Local pains, hyperæsthesia, paræsthesiæ, and so-called meningeal symptoms, such as pains and stiffness in the head, neck, and back, are variously attributed, without direct evidence, to involvement of nerve-roots, posterior-root ganglia, or their surrounding meninges. Though the course of virus invasion and the symptoms resulting are thus referable to specific lesions, it seems certain that lesions occur without either symptoms [120 310] or virus invasion,[159] and that both virus invasion [38] and symptoms [214] may occur without demonstrable lesions.

Both central œdema [254] and primary involvement of motor endings have been suggested as the cause of transient paralysis, but it is more probable that all muscle power and tendon-reflex loss are due to infection of anterior-horn cells,[69 247] with paralysis of the hundred or more muscle-fibres supplied by each.[84] Hence recovery of neurone function would follow not subsidence of œdema but repair of cells which have not reached a stage of neuronophagia.[31 272] Often only some muscles of a segment are affected,[207] and muscles supplied by four segments may be no less severely affected than those supplied by two,[216] possibly reflecting the functional, as well as the segmental, distribution of neurones.[267] Even in paralysed muscles only some of the motor units are usually involved [60 82]—in monkeys an average of 96%.[31] Those muscle-fibres whose neurones are destroyed in the first few days probably show an increased chronaxia [68] and become paralysed at once. Except for the remote possibility of their gaining a new axon terminal from a neighbouring healthy or regenerating axon [27 321 328] the paralysis is inevitably permanent. Paralysed fibres may fibrillate for more than a year [158] but presumably soon cease to form glycogen,[134] develop a reaction of degeneration in the second week, and subsequently atrophy, the myofibrillæ disappearing as connective tissue increases.[61 313] In contrast, fibres whose neurones recover during the first month presumably retrieve some power, even if they do not hypertrophy in company with unaffected fibres, with care, use, and possibly treatment.[135] But these paresed fibres may atrophy from disuse [290] or show a painful spasm or irritability to movement, attributed to (1) sympathetic activity, because relieved by paravertebral block,[71] or (2) lesions of internuncial neurones,[169] presumably releasing extensor two-neurone arcs, or (3) disordered reciprocal innervation from hypersensitivity to stretch.[61 327] Thus as a rule a muscle clinically paralysed is probably a mixture of motor units: some completely paralysed and atrophic, others paresed and irritable, a few perhaps truly spastic, some atrophic from disuse, some normal, and some ideally hypertrophic. An apparently normal muscle may often be a similar mixture and contain some paralysed units [277]; in monkeys up to 30% of motor neurones may be lost without clinical evidence.[31]

Death

Death is commonest on the 4th day of disease; 90% of deaths take place in the first fortnight—almost always from acute respiratory failure.[26 113 334] Apnœa results from either concurrent intercostal and diaphragmatic paralysis (spinal lesions) or from involvement of the respiratory centre (bulbar lesion). Asphyxia may follow laryngeal spasm or paralysis, or pooling of mucus.[113 232] Figures for the 1947 outbreak in Great Britain [74] are of interest in showing death and incidence of diaphragmatic paralysis running parallel: both the rule in the ascending type (60–80%), common in the bulbar types (33%), and uncommon in spinal types (3–5%).

Experimentally virus has been recovered from heart muscle [140]; and in man some deaths, after a sudden turn for the worse with pulmonary œdema, have been found to be due to a myocarditis.[282] But most of the later deaths follow a secondary pneumonia.

Diagnosis

The conclusive diagnosis of poliomyelitis presents unusual difficulties. The virus is too small to be seen with the ordinary microscope as may the larger viruses, such as those of smallpox and lymphogranuloma venereum. It resembles mumps virus but differs from all others infecting the central nervous system in not being primarily transmissible to the mouse. But unlike mumps virus it cannot easily be isolated in any other small animal or in the embryonated egg. Laboratory diagnosis thus depends on the following findings, listed in order of significance:

(1) Presence of virus in material prepared from (*a*) throat swabs [155] taken during the first week; (*b*) fæces [217] up to

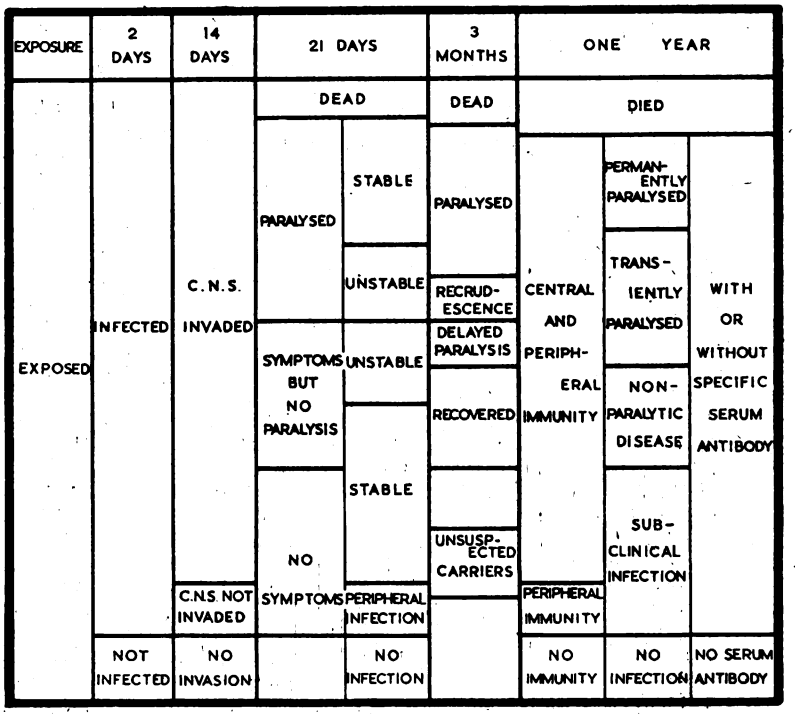

Fig. 3—Fate of a community exposed to infection with poliomyelitis virus.

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three months, or central nervous tissue removed at necropsy. The presence of the virus is shown by intracerebral inoculation of monkeys or possibly mice or cotton-rats.[6 231]

(2) A rising titre of homologous serum antibodies shown by mouse-protection tests against mouse-adapted strains or possibly by complement-fixation tests with concentrated antigens from cotton-rats.[202]

(3) Typical histological appearances in the central nervous system after death.

(4) Absence from the serum of complement-fixing antibodies to other neurotropic viruses whose presence could reasonably be considered possible because of endemicity and season or occurrence of known cases in the neighbourhood.

(5) Typical changes in the C.S.F.:

(*a*) A rise in total protein level above 45 mg. per 100 ml. if by Denis-Ayer method,[18] or above the equivalent of this if by any other method, appearing in about 80% of cases at any time up to six weeks after onset but maximal at the 10th day.[5 89]

(*b*) A positive globulin test—Nonne-Apelt or Pandy (immediate reaction with neutral salt)—in about 50% of cases.

(*c*) A raised total cell-count—i.e., above 1 per 3 c.mm.[241]—present in 80–99% of cases from the preparalytic stage onwards.[170]

(*d*) A predominance of mononuclear cells. In a minority of cases polymorphs exceed mononuclears, usually during the first few days, at times throughout,[202] and occasionally perhaps only at a late stage.[240] The incidence of polymorph predominance recorded by different observers in different places varies between 2%[240] and 60%.[205] Despite the considerable differences probably due to the use of different techniques it seems certain that the cellular reaction is not the same in all epidemics and may therefore prove to depend largely on the strain of virus responsible. It is noticeable that in no survey has use been made of an unimpeached technique, such as Alzheimer's,[4] Bostroem's,[41] or Hempel's,[133] though the need for speed has been well recognised and demonstrated.[205]

(*e*) Absence of bacteria, spirochætes, fungi, protozoa, and viruses.

(*f*) Negative Wassermann reaction.[181 212]

Of all these criteria the C.S.F. changes are least specific, since they may be found in several other virus infections besides encephalitis lethargica, tuberculous meningitis, leptospirosis, and glandular fever. They are, nevertheless, clearly the most important and the only practical aid for routine diagnosis, particularly in this country, during epidemics and in cases of subclinical infection.

EPIDEMIO-PATHOLOGICAL CORRELATION

The importance of poliomyelitis lies in the paralysis and deaths it causes, and is most clearly seen when, as in Minnesota in January, 1947, 31 persons in 10,000 under the age of 21 may be found permanently paralysed.[227] Of its interest the eight thousand or so papers written about it since 1900 leave no doubt. Yet the magnitude of poliomyelitis is still not precisely known. The occurrence of non-paralytic disease has been noted since 1896[67] and its incidence variously estimated as 0·3–100 times that of paralysis. Only recently, however, have daily temperature recordings, C.S.F. examinations, and virus studies been combined and controlled in an attempt to determine both the incidence of infection and the extent of invasion. So far the little evidence available[65] suggests that most young children who are intimate contacts become infected, and that extension to the central nervous system, accompanied by a slight rise in temperature, is the rule. In older children or other circumstances the possibility of apyrexial peripheral infection remains.

It appears then, as shown in fig. 3, that most of those exposed become infected, that in most of these the virus spreads to the central nervous system, and that in most with infection of that system no paralysis results. But the exact size of each majority in a given outbreak undoubtedly varies widely according to the natural resistance and acquired immunity of the population, besides the efficiency of transmission and virulence of virus. If the present lack of equilibrium[55] between virus and man is also taken into account, it becomes obvious that no quantitative generalisation is of much value. Despite these limitations it is reasonable to expect that, six weeks after exposure, about 0·2% of intimate contacts would be dead, about 2·8% paralysed and stable, and a few paralysed but liable to recrudescence. The 96–97% unparalysed would include a few liable to sudden paralysis; a few with subclinical loss of motor neurones; the majority with infection of the central nervous system shown by meningeal symptoms or C.S.F. changes; some, perhaps, with only an alimentary-tract infection and transient presence of virus in their fæces; and, lastly, some presumably with no infection, because with no symptom, no sign, and no virus.

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ANTIPEPTIC AND ANTACID THERAPY

WITH SPECIAL REFERENCE TO ADSORBENT COMPLEXES OF CALCIUM AND MAGNESIUM PHOSPHATES

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THE causes of persistent hyperchlorhydria remain obscure, and in only a small minority of cases can the condition be attributed to such secretory stimulants as alcohol, coffee, and condiments. Treatment cannot therefore be based on ætiology, and reliance must still be placed on the control of ultimate and penultimate mechanisms of gland, cell, and nerve-ending, or on neutralisation of the acid.

Atropine and its pharmacological associates, which paralyse vagus secretion under experimental conditions, have proved inadequate within the more exacting framework of clinical medicine. Since histamine is a powerful secretory stimulant, the recently introduced histamine antagonists have seemed worthy of trial, but Ashford and his colleagues (1948), who observed the effects of these substances on the human stomach, could not find any inhibition of secretion by 'Benadryl' (50 mg. sub cutem), 'Antistin' (100 mg. sub cutem), or 'Anthisan' ('Neoantergan') (100 mg. sub cutem). Wood (1948) has since reported that neoantergan increases rather than inhibits the gastric secretion produced in cats by the infusion of histamine. The depressant action of antimalarial drugs on gastric secretion reported by Babkin and Karp (1947) may find some useful application, but few might care to dose their hyperchlorhydric patients indefinitely with such compounds.

Thus the doctor is still unfortunately compelled to deal with the final end-product—the hydrochloric acid—using for this purpose preparations of non-toxic proteins, mucilages, salts, oxides, and hydroxides. Milk is by far the most valuable of this series, followed by the simpler compounds of magnesium, calcium, and aluminium, though casein derivatives, mucin, and organic gels have sometimes been used.

It is no longer thought advisable to depress acidity to the point of physical neutrality (pH 7) or beyond, except perhaps during gastric lavage, when sodium bicarbonate is used to increase the fluidity of unwanted

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mucus. It is customary to consider a peak acidity of pH 2·0–2·4 as characteristic of hypochlorhydria, and 3·5 to represent an absence of free hydrochloric acid. It should therefore suffice to reduce morbid degrees of acidity to these levels. To raise the pH further is to establish a new pathological state. At pH 5 peptic activity becomes negligible, and pH 7 is rarely encountered even in cancerous conditions, apart from gastrocolic fistulæ. A reasonable therapeutic target would be pH 2–4. Since peptic activity is almost maximal at pH 2, this value is to be preferred in non-ulcerative dyspepsia, and the lower acidity pH 4 reserved for the treatment of active ulceration.

Physicochemical measurements at the bench afford a useful guide for the selective prescription of antacid substances, but biological effects, as reflected in the analyses of gastric fractions, fall far short of the expectations aroused in the laboratory. The physiological estimate of daily secretion approximates to 1·5 litres of 0·4% HCl w/v. Kirsner (1941), using 2 g. hourly doses of magnesium carbonate *U.S.P.* (equiv. = 43·5% MgO) in alternation half-hourly with 90 ml. feeds of milk and cream, found that in the average of 20 cases acidity varied between pH 5 and pH 4. The extremes for individual patients were pH 3·5–1·8 and pH 6·8–6·0. On the convention that milk neutralises its own volume of *N*/10 HCl, the total antacid needed hourly was equivalent to 450 ml. of 0·4% HCl. Substituting calcium carbonate for the magnesium salt, Kirsner and Palmer (1940) induced a similar state of anacidity with the equivalent of 790 ml. of 0·4% HCl (average results of 26 cases), but the equivalent of 430 ml. was not so effective. If the physiological 1·5 litres is assumed to be secreted during the waking hours, the average hourly flow of acid is 94 ml., but in practice it is found that, to deal with this by half-hourly administration, 5–8 chemical equivalents of antacid are required. It is difficult to accept the implication that 80–88% of all ingested matter escapes into the duodenum without mixing with the gastric juice. Alternative views would be that the presence of neutralising agents in the stomach provokes much additional secretion, or that the physiological assessment of the rate of acid secretion is not valid in the circumstances.

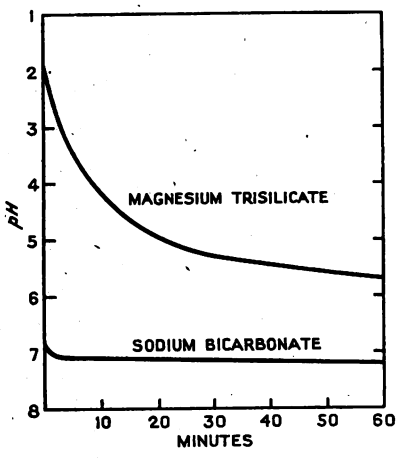

Fig. 1—Comparative effects of an immediate or stoichiometric antacid: 0·5 g. of sodium bicarbonate and 1 g. of magnesium trisilicate *B.P.* digested with 40 ml. of *N*/20 HCl at 38°C. The base in each case is in considerable excess. Note that sodium bicarbonate expends itself within a minute. Magnesium trisilicate reacts with comparative speed between pH 1 and pH 2 but continues much more slowly at acidities weaker than pH 5.

REAGENTS

The most important mineral pharmaceutical antacids are:

Magnesium oxide, carbonate, phosphate, trisilicate, and basic trisilicate.

Calcium carbonate, phosphate, and silicate.

Aluminium hydroxide, basic carbonate, phosphate, and amino-acetate, and aluminium sodium silicate.

Interacting with hydrochloric acid, these reduce hydrion concentration to various extents; and, when a small excess of base is used, the equilibrium pH values cover a wide range. A recent survey with pharmaceutical material gave magnesium trisilicate *B.P.* 6·9, calcium carbonate 6·5, tribasic magnesium phosphate 6·5, bismuth oxycarbonate 6·4, tribasic calcium phosphate 4·8, and hydrated alumina 4·1—all within the desirable clinical range—whereas magnesium oxide 9·6, "basic magnesium trisilicate" 7·8, and sodium bicarbonate 7·3 were definitely alkalinising agents to be used with greater caution.

TABLE I—INTRAGASTRIC ACIDITY MEASURED 30 MIN. AFTER ROUTINE HOURLY DOSES OF VARIOUS NEUTRALISING AGENTS

Antacid	Hourly dose*	Highest pH reached in 7-hour period	
		Most favourable case	Average for 19–26 cases
Magnesium carbonate	2·0 g.	6·8	5·0
Calcium carbonate	2·0 g.	5·6	4·3
Tribasic magnesium phosphate	2·0 g.	4·4	3·0
Magnesium trisilicate *U.S.P.* ..	2·0 g.	3·9	2·6
Tribasic calcium phosphate ..	2·0 g.	3·4	2·6
"Alumina gel" (ignited weight)	2·3 g.	2·9	2·3
Alumina gel	4 ml.	2·3	1·8

* Alternating half-hourly with milk feeds.

The velocity at which interaction proceeds affects the clinical status of the drugs. When the phosphates, oxides, and carbonates are used, the time required for completion of reaction is not sensibly greater than that required for the mixing of the two components, except in the case of bismuth, when very little change takes place during the first hour, and a day is required for completion. This slow rate of neutralisation is doubtless due to the conversion of the insoluble carbonate into an equally insoluble oxychloride, which retards the reaction by coating the remaining particles of carbonate. With magnesium trisilicate the rate of interaction adjusts itself to the strength of the acid to be dealt with. At hyperchlorhydric concentrations (pH 1·0–1·5) the reaction takes place rapidly and acidity is quickly reduced to the therapeutic level. At hypochlorhydric levels the rate becomes progressively slower, so the risk of over-neutralisation is negligible. Fig. 1 shows the contrast

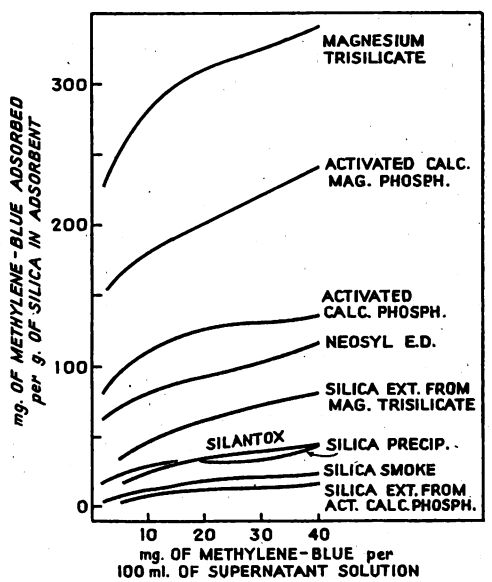

Fig. 2—Comparative adsorption isotherms for various forms of silica (0·1% aqueous methylene-blue agitated for 2 days at room temperature). Note the relatively high potency of silica physically associated with calcium or magnesium phosphate, and contrast it with the weaker actions of all the varieties of free silica tested. In magnesium trisilicate the silica is in chemical combination as a silicate.

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between an immediate or stoichiometric type of antacid, such as magnesium oxide or sodium bicarbonate, and a self-adjusting antacid, such as magnesium trisilicate. The rate of change induced in acidity at the various pH values is proportional to the downward slope of the curve. The flatness of the bicarbonate curve indicates complete lack of adjustment, its slight downward trend being caused by the slow loss of carbon dioxide from simple solution.

ANTIPEPTIC THERAPY

The digestive action of pepsin is considered by many clinicians to have an adverse erosive effect on the base of the peptic ulcer. This can be obviated in several ways.

(1) By overneutralising to pH values of 5 or more, at which the action of pepsin is abolished. Very heavy dosage is essential. Table I summarises the results recorded by Kirsner (1941) and Kirsner and Palmer (1940), who adopted the routine already mentioned and measured the acidity of fractions removed immediately before each milk feed over a period of seven hours.

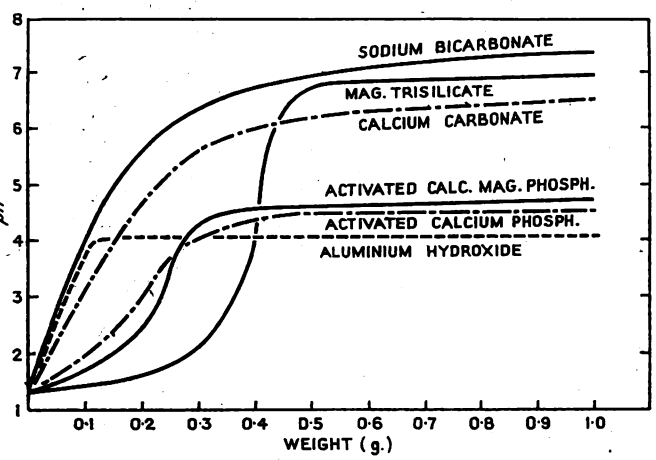

Fig. 3—Final pH values of 24-hour digests of 40 ml. of *N*/20 HCl with various proportions of various neutralising agents at 38°C. Note the various sustained plateaux when base is in excess.

It will be seen that, at 2 g. per hour, magnesium carbonate alone caused a sufficient rise in pH to abolish peptic activity. Theoretically all except calcium phosphate and the aluminium compounds should be efficacious, but a higher dosage, possibly about 4 g. hourly, would be needed for the purpose.

(2) By destruction of the pepsin with aluminium salts. Schiffrin and Komarov (1941) showed that pepsin is very sensitive to the action of aluminium salts at all acidities from pH 1 to 3·7. Inactivation by the chloride takes place without visible precipitation, and with the hydroxide and phosphate inactivation persists after complete solution has occurred. Though this action may be useful in the treatment of ulcerated areas exposed to enzyme action, it suggests that alumina may be detrimental in non-ulcerative dyspepsias.

(3) By adsorption of pepsin on to kaolin or silica gel (Mutch 1936). The pepsin thus removed from solution is not destroyed but can still carry out its digestive functions on a protein substrate of sufficient fluidity for collateral adsorption. Presumably the solid matter at an ulcer base is inaccessible to such activity.

(4) Certain substances remove pepsin from solution, forming insoluble complexes which, unlike the kaolin and silica adsorbates just considered, are devoid of proteolytic properties. Magnesium trisilicate, its basic variant, and the more recently devised antacid adsorbents known as "activated" calcium and magnesium phosphates belong to this group. Presumably the pH at the surface of these substances is sufficiently high to destroy such pepsin as comes into direct contact with them.

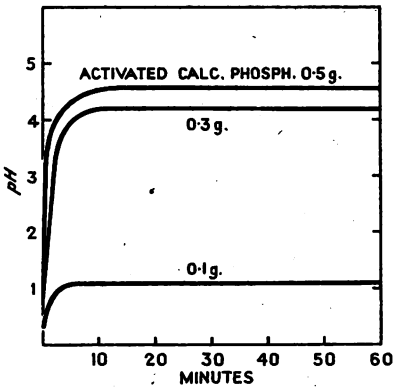

Fig. 4—pH values after various periods of interaction at 38°C between 40 ml. of *N*/20 HCl and different quantities of activated calcium phosphate. Note absence of appreciable reaction lag (cf. fig. 1).

"ACTIVATED" PHOSPHATES

These are complexes of hydrated silica and tribasic calcium or magnesium phosphate, produced by the precipitation of the two moieties simultaneously or of either in the presence of the other under suitable conditions of intimacy—e.g., by adding a solution of tribasic calcium phosphate in hydrochloric acid to an alkaline solution of sodium silicate. Three combinations have been studied:

(1) Tribasic calcium phosphate 75%, silica 25%.
(2) Tribasic magnesium phosphate 75%, silica 25%.
(3) Tribasic calcium phosphate 50%, tribasic magnesium phosphate 25%, silica 25%.

All are insoluble in water but interact with hydrochloric acid by stages to form the corresponding soluble chlorides and free phosphoric acid, together with a residue of hydrated silica:

Stage 1, with about pH 4·5 at the equilibrium point:
$Ca_3(PO_4)_2 + 4HCl + xSiO_2 = Ca(H_2PO_4)_2 + 2CaCl_2 + xSiO_2$

Stage 2, in the presence of excess acid sufficient to lower the pH to 1·4:
$Ca(H_2PO_4)_2 + 2HCl + xSiO_2 = 2H_3PO_4 + CaCl_2 + xSiO_2$

When 1 g. of the calcium-magnesium complex was added to 100 ml. of acid pepsin solution (0·001% pepsin in *N*/20 HCl, representing a substantial excess of acid over base), the pepsin lost its power to digest coagulated egg albumin. Magnesium trisilicate acts in a similar manner, though the silica-pepsin sorbate obtained when the acid and trisilicate are allowed to interact completely before pepsin is added retains its enzymic activity.

The adsorptive properties of the complexes were further examined with dyestuffs. Basic dyestuffs are taken up selectively in preference to acidic ones, and with aqueous methylene-blue 0·1% at room temperature approximate equilibrium is achieved in a few hours. The adsorptive power of dried silica gel is greatly influenced by the conditions of precipitation and drying. Fig. 2 shows the adsorption isotherms for silica extracted from the calcium phosphate complex and from magnesium trisilicate, together with pharmaceutically available silica gel ('Silantox'), industrial "precipitated silica," and the exceptionally fine powder known as 'Neosyl.' For comparison, graphs are also given for the flocculated silica smoke known as 'Submicron' silica (anhydrous; particle diameter 390 Å), for silica in the close physical association obtaining in magnesium and calcium phosphate complexes, and for silica chemically combined in the form of magnesium trisilicate *B.P.* In the graphs the valuable adsorptive powers of the phosphate complexes can be seen in suitable perspective. The amount of dyestuff taken up by the phosphates themselves is negligible; nevertheless silica in association with them shows adsorptive powers which are substantially greater than those found in any available variety of free silica.

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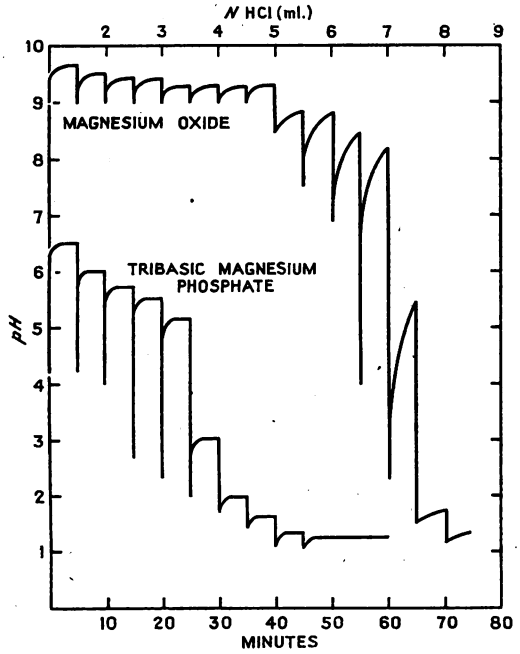

Fig. 5—pH values after serial additions of 1 ml. of *N* HCl to an original excess of magnesium oxide and tribasic magnesium phosphate suspended in 40 ml. of water (the amount of each preparation used contained 0·3 g. of MgO). Acid added at intervals of 10 min. until in excess. Note progressive buffering action of phosphate.

ANTACID PROPERTIES OF PHOSPHATE-SILICA COMPLEXES

Equilibrium values (glass electrode) are given in fig. 3 for the pH of various mixtures of the complexes and other antacids with *N*/20 HCl. As the proportions of base to acid were increased, the pH rose to the following plateaux; calcium complex 4·55, magnesium complex 6·55, and calcium-magnesium complex 4·70.

At 38°C, with shaking, equilibrium is reached in a little less than 10 min., a reaction lag which is too small to have any clinical significance (fig. 4). To simulate in some fashion the effect of the continual secretion of acid after the intake of a single dose of drug, the complex was suspended in 40 ml. of water at 38°C and stirred continuously. The pH was recorded each minute with a glass electrode, and 1 ml. of *N* HCl was added every 10 min. until a definite excess of acid over base was eventually achieved. In fig. 5 MgO was compared with tribasic magnesium phosphate, the amounts of each substance used representing 0·3 g. of MgO. The simple oxide maintained a pH of a little over 9 continuously until almost exhausted, when the acidity rapidly rose to pH 1–2. The progressive buffering action of the phosphate is to be seen in the continuous fall which takes place throughout the process of acid additions. The abrupt change after the sixth addition corresponds to a complete conversion of the phosphate to a monobasic form.

Similar graphs for "activated" calcium phosphate and "activated" calcium-magnesium phosphate are given in fig. 6. Equal 1 g. weights of each were used for the experiment. The magnesium complex produces the higher initial pH value, but, on the basis of equal weights, it has a slightly smaller total buffering value than the calcium compound.

Clinical Observations

In-vivo observations were made by the fractional test-meal technique. Deductions concerning the action of antacids are often made from inadequate numbers of imperfectly controlled experiments. Kopeloff (1922) has shown that, if the standard Rehfuss technique is adopted, widely varying results may be obtained if observations are repeated at intervals of a few days, and graphs of isosecretory, continued, or hyposecretory types may be obtained in succession from the same person. It seems then that at least three control test-meals and three observational ones are needed for each case unless the series of cases is of considerable length. To secure reliable data on a limited number of people the triple test-meal routine has been adopted and an attempt made to record dose-response variation.

On observational days the selected dose of antacid (3·5, 7, or 14 g.) was given in 100 ml. of water immediately after withdrawal of the first fraction. On control days 100 ml. of distilled water was substituted for the suspension. Fractions were tested every 15 min. until acidity began to rise above pH 4. The duration of the anacid period was recorded as an index of the antacid effect of the administered dose. From table II it is apparent that, even with relatively massive 14 g. doses, the contents of the stomach cannot be kept physiologically neutral for much more than an hour. A 7 g. dose appears to be almost equally effective, as might well be the case if the falling off in control is due to evacuation of the antacid material into the duodenum. This finding is in accordance with many earlier observations on the relatively evanescent effect of antacids in general. The lowest dose (3·5 g.) produced an appreciable but not an optimal response. The dose of election for continuous control seems to be about 7 g. given hourly; or, if given in alternation with milk feeds, the phosphate could be spaced at intervals of 2 hours. But cases 7, 8, and 11 indicate that, even on this routine, perfect control cannot always be secured.

BIOLOGICAL ASSESSMENT

Ulcers produced in laboratory animals bear little resemblance to the chronic peptic ulcer of man. The Mann-Williamson dog, with gastrojejunostomy and transplanted bile-duct and pancreatic duct, inevitably develops jejunal ulceration, and the mortality is 100%. The administration of sufficient alumina to abolish "free" hydrochloric acid from the stomach continuously does not save any of the dogs, though in some curious way hydrated aluminium phosphate ($AlPO_4$,xH_2O) reduces the incidence of ulcer to 13%, even though it does not neutralise the gastric contents (Fauley et al. 1940). Jejunal ulceration produced by lavage of an isolated jejunal loop with an acid-pepsin solution is prevented by the addition of alumina or of aluminium phosphate to the lavage fluid (Schiffrin 1940), and one suspects that almost any neutralising agent would be equally effective.

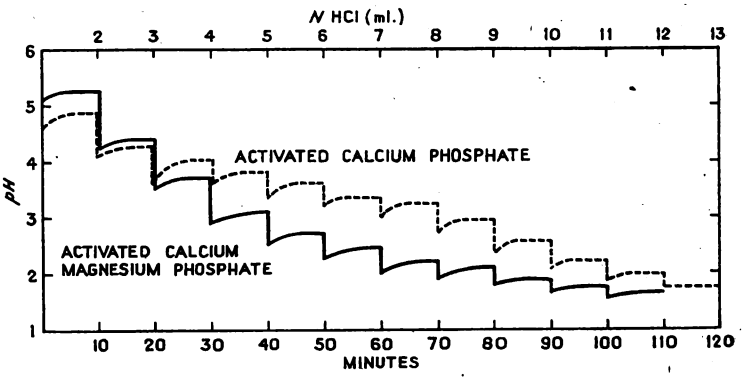

Fig. 6—pH values during successive additions of 1 ml. of *N* HCl to 1 g. of phosphate-silica complexes suspended in 40 ml. of water at 38°C. Note sustained buffer action and somewhat greater over-all effect of calcium complex.

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TABLE II—DURATION OF ANACIDITY AFTER SINGLE DOSE OF ANTACID. DATA FROM STANDARD REHFUSS TEST MEALS. "ACTIVATED" CALCIUM-MAGNESIUM PHOSPHATE WAS INTRODUCED IMMEDIATELY AFTER WITHDRAWAL OF THE FIRST FRACTION. SAMPLES WERE TAKEN AT 15 MIN. INTERVALS

Case no.	Dose (g.)	Duration of anacid period (min.)*	Prolongation attributable to antacid (min.)	Mean for all cases and tests (min.)
1	3·5	45	45	
	Control	0		
2	3·5	30	30	
	Control	0		30
3	3·5	45	30	
	Control	0		
4	3·5	15	15	
	Control	0		
5	7	105	105	
	Control	0		
6	7	75	60	
	Control	15		56
7	7	30	30	
	Control	0		
8	7	45	30	
	Control	15		
9	14	90	75	
	Control	15		
10	14	60	60	
	Control	0		60
11	14	45	30	
	Control	15		
12	14	75	75	
	Control	0		

* Average of 3 meals for each figure.

No-one has yet devised a convincing method of assessing the relative healing or prophylactic virtues of the various antacids given to patients with peptic ulceration. Radiography, fæces tests, and careful consideration of clinical signs and symptoms do not afford any certitude that healing has been effected. Gastroscopy is scarcely admissible for repeated observations on a statistically significant scale and it too has its inherent errors. In these circumstances little direct therapeutic assessment can be achieved beyond the symptomatic.

A bulk supply of representative phosphate complexes, prepared by Messrs. Thomas Tyrer & Co., was given to patients with indigestion or chronic peptic ulceration. The calcium phosphate complex was found to be somewhat constipating, to counteract which effect 3 or 4 oz. of 25% paraffin emulsion daily was required. The compound consisting of calcium phosphate 50%, magnesium phosphate 25%, and silica 25% did not affect the bowel action materially and was therefore adopted for more extended trial.

Ten patients under treatment for chronic peptic ulcer and 13 new cases were selected. "Activated" calcium-magnesium phosphate was given as the sole medicinal antacid in 2 drachm doses two-hourly. The patients were in bed on a routine of milk feeds. The process of healing, as observed by radiography and gastroscopy, followed the usual successful but occasionally erratic course in patients undergoing this type of treatment. No attempt was made to compare the efficiency of the regimen quantitatively with that of any other scheme. Clinically judged the results were excellent. The phosphate complex controlled postprandial pain satisfactorily, but relief did not follow quite so quickly as is usual after magnesium oxide or the carbonated antacids. The efficacy of a bedtime dose in preventing mid-nocturnal pain was not so great as that of alumina but compared favourably with other antacids.

The symptomatic relief of heartburn was observed in 18 other patients with non-ulcerative dyspepsia.

SUMMARY

The methods of diminishing intragastric acidity are reviewed and the differential properties of the available reagents described.

The wide divergence between the physiological assessment of acid secretion and the amount of antacid material required in practice to secure neutrality is emphasised.

The antipeptic action of certain medicinal antacids is discussed. Evidence is given to show that it is not feasible to reduce acidity continuously below the level of peptic activity by the administration of alkalis unless the clinical conditions are exceptional, but that aluminium salts destroy pepsin, kaolin and silica gel form pepsin adsorbates with enzymic activity, magnesium trisilicate and silica-phosphate complexes form adsorbates which are devoid of such activity.

The general properties of complexes of silica gel with the tribasic phosphates of calcium and magnesium are described. Their antacid actions are equivalent to those of their phosphate contents. The adsorptive action of their silica moiety, while retained in the complex form, is outstandingly greater than that of any available variety of dried free silica gel.

The influence of the double calcium-magnesium complex on the reaction of test-meal fractions in peptic-ulcer patients has been measured, with suitable controls, and it has been shown to be an adequate antacid in the treatment of chronic peptic ulceration.

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PROCAINE PENICILLIN

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THE present communication is concerned with a compound of procaine and penicillin which delays the absorption of penicillin and has none of the disadvantages of other preparations.

The best-known preparation to delay absorption is that of penicillin incorporated in a mixture of peanut oil (arachis oil) and beeswax (Romansky and Rittman 1944), which gave a detectable blood-penicillin level for 24 hours after a single injection of 300,000 units. The chief disadvantage of this preparation is its viscosity. It is solid at room temperature; hence the material and the syringe must be warmed before use, and even then a relatively wide-bore needle has to be used, which is a source of discomfort to the patient. The presence of beeswax is a further disadvantage and has been cited as responsible for frequent and unfavourable reactions following intramuscular injections of this preparation.

A mixture of penicillin in ethyl-oleate and beeswax is another preparation which is known to delay absorption of penicillin. It is fluid at room temperature and can be injected through a fine needle but was found by May (1948) to give results inferior to the original Romansky formula; many patients experienced dull aching pain after intramuscular injections, and severe pain and inflammation at the site of injection precluded its use by the subcutaneous route.

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Procaine penicillin was first described by Sullivan et al. (1948), and preliminary trials have been reported from the United States (Boger et al. 1948, Cameron 1948, Herrell et al. 1947, Hewitt et al. 1948, Hobby et al. 1948, Whittlesey and Hewitt 1948). In this country only one report has so far been published on this subject (Jones and Shooter 1948).

Procaine penicillin G is a stable crystalline salt obtained by double decomposition of sodium penicillin and procaine hydrochloride. The compound is composed of crystals about 60 μ long and is sparingly soluble in water (about 0·7%). It has a potency of about 940 units per mg. It is easily administered through a needle normally used for intramuscular injections, requires no warming, and produces no pain at the site of injection or other undesirable side-effects. Even with a large intragluteal dose (1,000,000 units in 3·3 ml.) only slight discomfort was experienced; the discomfort was less in patients confined to bed than in ambulant patients.

More recently procaine pencillin has been incorporated with aluminium monostearate in oil, and this has been shown to be even more slowly absorbed than the other preparations. Thus a dose of 300,000 units gave therapeutic blood-penicillin levels for up to 96 hours (Kitchen et al. 1949, Robinson et al. 1948, Thomas 1948, Thomas et al. 1948). Though procaine penicillin in oil with aluminium stearate is now produced and distributed in this country, no experimental report has so far been published here about its use.

PRESENT INVESTIGATION

The main object of this work was to test various compounds of procaine penicillin to find a repository preparation which would ensure a blood-penicillin level of 0·06 units or more per ml. at 24 hours after a single small injection. Three preparations were used in this trial:

1. Procaine penicillin in arachis oil.
2. Procaine penicillin in water.
3. Procaine penicillin in arachis oil with aluminium stearate.

The oily preparations, with or without aluminium stearate, were issued in ampoules of 10 ml. containing 300,000 units of penicillin per ml. The watery preparations, which were supplied in the form of a dry powder, contained 300,000 units per ml. after the addition of 10 ml. of water. Most preparations were designated fine-particle, which varied in size from 5 to 20 μ, but one manufacturer supplied coarse-particle (60 μ) oily and watery preparations. The coarse-particle oily preparation gave, in the few patients tested, blood-penicillin levels similar to those given by the fine-particle oily material, but there were technical difficulties in its administration.

The oily preparations were fluid at room temperature and, after vigorous shaking for a minute or two, gave an even suspension which could be injected readily through a no. 1 or a no. 12 needle. To withdraw the material from the ampoule, however, a rather larger needle, comparable in size to a blood-transfusion needle, was found most convenient. It was unnecessary to warm the material or the syringe before use. The fine-particle watery suspension was no more difficult to use than ordinary soluble penicillin, except that withdrawal from the ampoule and injection into the patient had to be done rapidly to prevent the penicillin from settling out of suspension in the syringe; but the coarse-particle watery suspension could not be administered because of clogging of the needle and syringe.

The injections were mostly intragluteal, and one patient had it in the triceps without discomfort. For patients receiving 2,000,000 units (6·6 ml.) of the oily preparation of procaine penicillin with aluminium stearate the dose was divided between the gluteal regions (3·3 ml. each).

Three classes of persons were used in this investigation:

(1) Normal ambulant members of the staff of the department.

(2) Ward patients with various diseases, including subacute bacterial endocarditis, furunculosis, carbuncle, actinomycosis, &c. (All patients with diminished renal function were excluded from this trial.)

(3) Ambulant patients attending the venereal diseases clinic with gonorrhœa.

In the first and second groups blood samples were obtained at 4-hour intervals when practicable, and in all cases at 24 hours after injection.

The third group were all males. Blood was taken usually at 24 hours after injection and, in those who received the stearate preparation, at subsequent 24-hour intervals.

Serum-penicillin levels were estimated by the capillary tube method of Fleming and Smith (1947), a hæmolytic streptococcus being used as the indicator organism. A level of 0·06 units per ml. was regarded as the lowest therapeutic level for the purposes of this trial.

EXPERIMENTAL RESULTS

Procaine Penicillin in Oil and Water Suspensions

The results obtained after a single injection of oil and water suspensions of procaine penicillin are summarised in table I. The number of cases, out of the total investigated, which had blood-penicillin levels of 0·06 units or more per ml. at the 20th and 24th hours after injection are recorded. Owing to the small number of patients, the differences between the various batches of oily and watery procaine penicillin cannot be assessed with any degree of precision, but the total numbers in each group are large enough to indicate the results to be expected in clinical practice.

It may be seen that, after an injection of 300,000 units of the watery or oily preparations, about four-fifths of the patients had a therapeutic blood-penicillin level at 20 hours, but at 24 hours the oily preparation gave this level in a greater proportion of cases than did the watery. With a dose of 600,000 units, however, whether as an oil or water suspension of procaine penicillin, all cases had a level of 0·06 units or more per ml. at 20 and 24 hours.

TABLE I—INJECTION OF 300,000 UNITS PER ML. OF PROCAINE PENICILLIN IN OIL, IN WATER, AND IN OIL WITH ALUMINIUM STEARATE

Type of suspension	Dose (units)	No. of cases with blood-penicillin levels of 0·06 unit or more per ml.	
		At 20 hours	At 24 hours
Oily without stearate	300,000	16 out of 20	43 out of 68
Watery " "	300,000	16 " " 21	13 " " 26
Oily " "	600,000	10 " " 10	10 " " 10
Watery " "	600,000	4 " " 4	8 " " 8
Oily with stearate ..	300,000	..	64 " " 65

In table II the approximate average blood-penicillin levels at 4-hour intervals are shown. From this it appears that there was little difference in the first 12 hours between the 300,000 and 600,000 unit groups, but that the 24-hour levels were consistently higher in the 600,000 unit groups than in the 300,000.

It is important to note, however, that there were considerable variations among the patients. The blood-penicillin levels obtained after 4–8 hours varied from 0·25 to 4 units per ml. in the 300,000 unit groups, and from 0·25 to as high as 8 units per ml. in the 600,000 unit groups. In many cases the highest blood-penicillin level was maintained for 12 hours; but, as would be expected, those with the highest levels fell to zero before the end of the 20th or 24th hour.

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TABLE II—AVERAGE BLOOD-PENICILLIN LEVELS AFTER A SINGLE INJECTION OF PROCAINE-PENICILLIN PREPARATIONS

Type of suspension	Dose (units)	No. of patients	Blood-penicillin levels (units per ml.) after hours					
			4	8	12	16	20	24
Oily without stearate	300,000	32	1·0	1·0	0·5	0·5	0·125	0·06
Watery ,, ,,	300,000	10	1·5	1·0	0·75	0·5	0·25	0·06
Oily ,, ,,	600,000	10	2·5	3·0	1·0	0·5	0·5	0·25
Watery ,, ,,	600,000	4	1·0	0·5	0·5	..	0·25	0·25
Oily with stearate ..	300,000	4	1·0	1·5	..	1·25	1·0	0·25

Procaine Penicillin in Oil with Aluminium Stearate

After a single injection of 300,000 units in 1 ml., 64 out of 65 cases had a blood-penicillin level of 0·06 units or more per ml. at 24 hours (table I), whereas at the end of 2 days 32 out of 42 cases still had penicillin in the blood, and at 3 days 15 out of 25 cases, which is much longer than with the oil and water suspensions without aluminium stearate.

In 4 cases in which blood-penicillin levels were estimated at 4-hour intervals for the first 24 hours the results obtained were similar to those for the group which received 600,000 units of the preparation without aluminium stearate (table II). 8 patients who received a single injection of 2,000,000 units of procaine penicillin in oil with aluminium stearate had levels ranging from 1 to 2 units per ml. at 24 hours, followed by a gradual daily decline to zero on the 6th–8th day.

DISCUSSION

Clinical and laboratory tests have shown that procaine penicillin in oil or water suspensions, with or without aluminium stearate, fulfills most of the conditions of an effective slow absorbing penicillin preparation, and this is in accord with the findings of other workers.

The experiments have shown that there was no outstanding difference between the oily and watery preparations of procaine penicillin without aluminium stearate. But, with a dose of 600,000 units, 100% of cases had a therapeutic blood-penicillin level at 24 hours, whereas 300,000 units gave this level in only 50–60% of cases. It therefore seems that, provided a dose of 600,000 units is used, procaine penicillin suspended in water is just as effective as when suspended in oil. However, the latter gains in advantage when incorporated with aluminium stearate, since a dose of only 300,000 units was as effective as 600,000 units of the former in maintaining a therapeutic blood-penicillin level in almost all the cases tested (tables I and II).

Particle size of penicillin crystals is an important feature in the composition of an efficient long-lasting preparation (Thomas et al. 1948). In the present investigation material containing large particles was unworkable because of clogging of the needles; a particle size of 5–20 μ was eminently suitable.

It was noted that the highest blood-penicillin level occurred between 4 and 8 hours after injection, but that the high peak and rapid fall which follows the injection of aqueous penicillin was absent. A given level was often maintained for hours or, in the case of the material containing aluminium stearate, for days without change. The effect of these preparations resembles that of the drip infusion, practised with such success in the early days of penicillin therapy.

In the treatment of acute cases, when it may be desired to reach a high blood-penicillin level rapidly, procaine penicillin with or without aluminium stearate is unsuitable, unless combined with a soluble salt of penicillin. A preparation containing 250,000 units per ml. of procaine penicillin in oil with aluminium stearate together with 50,000 units per ml. of soluble penicillin combined the advantages of a rapid initial absorption followed by delayed action. Alternatively a separate injection of aqueous penicillin can be given at the same time as the procaine salt.

Crystalline procaine penicillin in oil with aluminium stearate may remove the greatest drawback in penicillin therapy—i.e., the necessity for frequent injections. There remains, however, one question from the clinical aspect for which time alone can provide the answer: whether continuous low blood-penicillin levels will prove adequate for the needs of diseases like syphilis, actinomycosis, subacute bacterial endocarditis, &c., in protracted penicillin therapy. So far clinical results have been encouraging, but further observation over a longer period will be necessary before these results are definitely confirmed.

SUMMARY

Injections of procaine penicillin, in oil, in water, and in oil incorporated with aluminium stearate, containing 300,000 units per ml. were given to 185 persons.

Procaine penicillin G in oil with aluminium stearate was superior to other preparations tested for delaying absorption of penicillin. It is a stable preparation easy to administer, causes no pain or undesirable side-effects, and in a dose of 300,000 units gave therapeutic blood-penicillin levels for 24 hours in virtually 100% of cases tested.

Tests with oil and water suspensions of procaine penicillin, without aluminium stearate, have shown that with a dose of 600,000 units 100% of cases gave a therapeutic level at the end of 24 hours; with a dose of 300,000 units, however, only 50–60% gave this level.

A few patients received a single dose of 2,000,000 units of procaine penicillin with aluminium stearate in oil, and most had a therapeutic blood-penicillin level for a week after injection.

A preparation of procaine penicillin in oil with aluminium stearate together with soluble penicillin combined the advantages of rapid initial absorption followed by delayed action.

Procaine penicillin G in oil with aluminium stearate is the most suitable preparation for clinical use where economy in material, slow absorption, and a long-lasting therapeutic blood-penicillin level is important.

We are indebted to Sir Alexander Fleming for his guidance and valuable help; to Dr. G. L. M. McEligott and Dr. F. J. G. Jefferiss, of the venereal diseases clinic, St. Mary's Hospital, for their coöperation; to Dr. H. C. Stewart for his interest in this paper and kind advice; and to Sister B. W. Parry and the nurses for their care and assistance with blood samples. Messrs. Allen and Hanburys, Imperial Chemical Industries (Pharmaceuticals), and Glaxo Laboratories supplied the drugs.

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PROCAINE PENICILLIN IN INFANTS AND CHILDREN

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THE commonly used salts of penicillin, when injected into the body in aqueous solution, are rapidly excreted by the kidneys; hence it has been customary to maintain adequate therapeutic blood levels by injecting penicillin at short intervals. Various methods of prolonging the action of one injection by delaying absorption or excretion have been used, but none is free from disadvantages. A suspension of penicillin in peanut oil and beeswax is slowly absorbed (Romansky and Rittman 1944) but is difficult to handle and often irregularly absorbed, and repeated injections cause reactions in 14% of patients (Horne 1948). 'Caronamide' (Beyer 1947) inhibits the tubular excretion of penicillin, but the possibility that it may in some cases cause renal damage has not yet been excluded (Hunter and Wilson 1948, Meads et al. 1948).

Last year Salivar et al. (1948) and Sullivan et al. (1948) described a new and stable compound of crystalline penicillin G combined with procaine hydrochloride, which could be injected as a suspension in oil and gave bacteriostatic blood levels persisting for a long time. Experiments on animals showed that this compound was non-toxic, and its therapeutic action was soon confirmed in man by Hewitt et al. (1948) and other American workers, who showed that after an intramuscular injection of 1 ml. of a suspension containing penicillin 300,000 units, therapeutic blood levels persisted in 80–90% of patients for twenty-four hours. Boger et al. (1948) found that of 23 patients with pneumonia 18 recovered after one injection of 300,000 units.

We have confirmed (unpublished results) that in adults an intramuscular injection of procaine penicillin 300,000 units maintains therapeutic blood levels for twenty-four hours in over 80% of patients. A peak blood level of 1–2 units of penicillin per ml. is attained in two hours, lasts a further three or four hours, and thereafter gradually falls. Increasing the dose prolongs the duration of action beyond twenty-four hours but does not greatly raise the blood-penicillin levels.

The investigation reported here was designed to assess the value of procaine penicillin in infants and children by estimating the blood levels of penicillin following a single injection.

* This work was carried out during the tenure of a Crichton research scholarship.

TABLE I—BLOOD-PENICILLIN LEVELS IN INFANTS AFTER A SINGLE DOSE OF PROCAINE PENICILLIN

Group and case no.	Age (days)	Sex	Birth weight (lb. oz.)	Blood-penicillin levels (units per ml.) at 2 hr.	12 hr.	24 hr.	36 hr.	48 hr.
Group 1:								
1	2	F	5 4	10·0	20·0	20·0	2·5	0·5
2	4	F	4 14	6·25	6·25	0·6	0	..
3	16	F	4 0	6·25	2·5	0·25	0	..
4	13	F	4 3	25·0	12·5	2·5	0·5	0·06
5	12	M	4 4	6·25	1·25	0·12	0·25	0
6	3	M	4 5½	25·0	25·0	1·25	0·6	0
7	1	F	4 14½	6·25	25·0	5·0	1·25	0·25
8	6	M	3 8½	6·25	6·25	0·5	0	..
9	23	M	5 3½	6·25	1·25	0·6	0·06	0
10	23	F	5 3½	6·25	1·25	0·06	0	..
Group 2:								
1	2	M	6 5	12·5	10·0	5·0	1·0	0·03
2	1	F	8 8	12·5	10·0	2·0	0·25	0
3	1	F	8 10	5·0	6·25	2·5	2·5	2·0
4	4	M	8 12	5·0	5·0	2·5	0·5	0
5	2	F	9 9	2·5	5·0	5·0	2·5	1·0
6	1	M	8 8	5·0	2·5	5·0	2·5	0
7	1	F	8 7	12·5	25·0	6·25	0·6	0·25
8	2	M	8 15	6·25	12·5	2·5	0·12	0·06
9	1	F	6 8½	12·5	25·0	6·25	1·25	0·5
10	4	M	8 9	10·0	5·0	2·5	5·0	2·5
Group 3:								
1	8	F	5 12	12·5	6·25	0·6	0	..
2	8	M	6 12	5·0	2·5	0·06	0	..
3	7	M	6 14½	2·5	2·5	2·5	0·6	0
4	8	M	7 7½	5·0	2·5	0·3	0	..
5	11	M	8 12	2·5	2·5	2·5	2·5	2·5
6	9	M	7 5½	12·5	6·25	0·6	0·12	0
7	15	F	6 8	6·25	2·5	0	..	..
8	8	F	7 13½	12·5	12·5	1·25	0·03	0
9	8	F	7 1½	6·25	6·25	1·25	0·06	0
10	8	M	7 10½	6·25	6·25	1·25	0·25	0

Group 1, premature infants, dose of procaine penicillin = 60,000 units.
Group 2, aged 1–5 days, " " " = 100,000 units.
Group 3, aged 7–15 days, " " " = 100,000 units.

MATERIAL AND TECHNIQUE

The preparation used was a suspension of procaine penicillin G in arachis oil, supplied by Glaxo Laboratories, in which 64·5% of the particles were less than 50 μ in diameter (mostly 15–50 μ) and 34·5% were larger than 50 μ (50–100 μ). It was put up in 10 ml. ampoules, and, when well shaken, passed easily through a 19-gauge needle. It was given by deep intramuscular injection into the upper outer quadrant of the buttock.

Ten patients were selected from each of the following groups: (1) premature infants; (2) infants aged 1–5 days; (3) infants aged 7–15 days; (4) children aged 1–12 months; (5) children aged $1^1/_2$–3 years; and (6) children aged 4–9 years. Groups 1–3 were all healthy; groups 4–6 were for the most part convalescent from acute infections.

The dose of procaine penicillin was graded according to age: group 1 received a single injection of 60,000 units, groups 2–4 100,000 units, group 5 150,000 units, and group 6 300,000 units. Specimens of capillary blood were taken two, twelve, twenty-four, thirty-six, and forty-eight hours after the injection. Initially specimens were also obtained after one hour and three hours; but, as it became apparent that the highest blood-penicillin level was attained in two hours, these were discontinued. It was also found unnecessary to procure specimens in groups 4–6 for longer than twenty-four hours. Penicillin estimations were made by the method of Fleming and Smith (1947).

REACTIONS

The incidence of sensitivity to procaine penicillin has been estimated by Wellman and Herrell (1948) as less than 1%. No reactions, either local or general, were encountered in this series, and injections were completely painless.

RESULTS

Infants.—In groups 1–3 (table I), who were given an average dose of procaine penicillin 30,000 units per kg. of body-weight, the highest blood level of penicillin was 2·5–25·0 units per ml. This was usually maintained for twelve hours, after which it gradually fell. In group 2 the fall was very slow, and after forty-eight hours seven of the ten babies still had penicillin present in the blood in detectable amounts; whereas in group 3 the fall was more rapid, and at forty-eight hours all but one gave negative results. This difference, which is statistically significant, is presumably due to the period of physiological dehydration following birth. The premature infants behaved in these respects like the two other groups, the duration of action depending largely on age.

Penicillin is apparently not excreted in breast-milk. Samples of milk from patients receiving penicillin in the usual therapeutic dose (100,000 units four-hourly) show no bacteriostatic activity. Nor has penicillin been detected in the blood of breast-fed infants whose mothers were being treated with penicillin in the same dosage.

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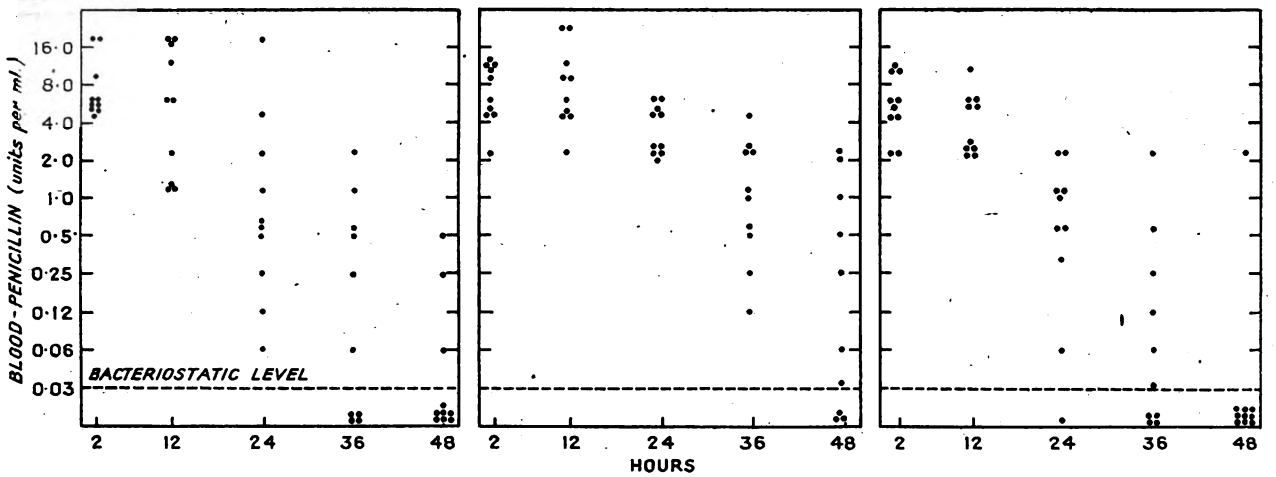

Fig. 1—Blood-penicillin levels in infants after a single intramuscular injection of procaine penicillin: group 1, premature (60,000 units); group 2, aged 1-5 days (100,000 units); group 3, aged 7-15 days (100,000 units).

Children.—In groups 4–6 (table II) there was considerably more variation in weight, but the average dose of procaine penicillin per kg. of body-weight was about 16,000 units. Blood levels reached a peak of 1–5 units of penicillin per ml. and thereafter fell steadily, but a therapeutic blood-penicillin level (at least 0·03 unit per ml.) was still present in 23 out of 29 children at the end of twenty-four hours. In two cases of nephritis (in which there was renal damage as shown by the presence of albumin and casts in the urine) and in one case of cœliac disease, the curves obtained by plotting the blood-penicillin levels against time were flat and the levels remained persistently high (0·5 unit per ml.) at twenty-four hours. A similar delay in the excretion of penicillin has been noted in adults with renal disease, and is presumably due to impaired tubular function. No explanation is offered of the delayed excretion in cœliac disease.

Comment.—It will be seen from graphs (figs. 1 and 2) of the six groups that individual blood levels of penicillin, when plotted against time, show a wide scatter of points. A curve which represents the average effect can be obtained by connecting either the median points or the arithmetic means, the more accurate picture being obtained by connecting the median points (fig. 3).

THERAPEUTIC INDICATIONS

In a study of infection in the newborn, Henderson (1943) reviewed the statistics of the Simpson Memorial Maternity Pavilion for the years 1940–42. He found that, of a total neonatal mortality of over 47 per 1000 live births, infection (22%) ranked second only to asphyxia (28·8%) as the primary cause of death. The predominating infecting organism was *Staphylococcus aureus*. Todd (1948), among others, has shown that septicæmia is not uncommon.

TABLE II—BLOOD-PENICILLIN LEVELS IN CHILDREN AFTER A SINGLE DOSE OF PROCAINE PENICILLIN

Group and case no.	Age (yr. mth.)	Sex	Weight (lb. oz.)	Diagnosis	Blood-penicillin levels (units per ml.) at 2 hr.	12 hr.	24 hr.
Group 4:							
1	0 8	M	15 0	Pink disease	4·0	0·5	Not done
2	0 8	M	13 8	Scurvy	4·0	0·5	0·06
3	0 7	F	16 0	Difficulty in feeding	2·0	0·5	0·06
4	0 2	M	8 2	Difficulty in feeding	1·25	0·6	0·06
5	0 10	M	19 8	Meningococcal meningitis	1·25	0·12	0
6	0 1	F	7 0	Thrush	1·25	0·06	0
7	1 0	F	17 0	Pneumonia	2·5	0·12	0·03
8	0 3	F	7 4	Difficulty in feeding	2·5	0·6	0·06
9	0 2	M	8 0	Difficulty in feeding	5·0	0·6	0·03
10	0 2	M	9 12	Habitual vomiting	5·0	0·5	0·12
Group 5:							
1	1 6	F	18 8	Cœliac disease	4·0	1·0	0·5
2	1 2	F	21 0	Meningococcal meningitis	5·0	0·6	0·03
3	1 6	F	20 8	Primary amentia	5·0	0·6	0·06
4	2 9	F	26 0	Pneumonia	2·5	0·12	0·03
5	2 9	F	25 0	Pneumonia	5·0	0·12	0
6	2 3	M	26 4	Chronic intestinal dyspepsia	0·5	1·25	0·06
7	1 7	M	17 8	Bronchopneumonia (convalescent)	5·0	1·25	0
8	2 0	M	25 8	Acute pharyngitis	2·5	0·6	0·25
9	1 6	M	27 8	Primary tuberculosis	2·5	0·6	0·12
10	3 0	F	27 0	Cœliac disease	4·0	1·0	0·12
Group 6:							
1	5 0	F	29 8	Pink disease	2·5	0·5	0
2	4 6	F	36 4	Epituberculosis	1·0	0·25	0·06
3	4 0	F	26 0	Bronchiectasis	1·0	0·12	0·06
4	9 0	F	52 0	Nephritis	4·0	0·5	0·12
5	6 0	M	42 0	Nephritis	2·0	1·0	0·5
6	7 0	M	43 8	Primary tuberculosis	1·25	0·5	0·12
7	5 0	F	32 0	Congenital megacolon	4·0	1·0	0·25
8	4 0	F	32 0	Nephritis	1·25	0·6	0·5
9	8 0	M	62 0	Primary tuberculosis	2·5	0·5	0·03
10	8 0	M	57 8	Primary tuberculosis	2·5	0·06	0

Group 4, aged 1–12 months, dose of procaine penicillin = 100,000 units.
Group 5, aged 1½–3 years, „ „ „ = 150,000 units.
Group 6, aged 4–9 years, „ „ „ = 300,000 units.

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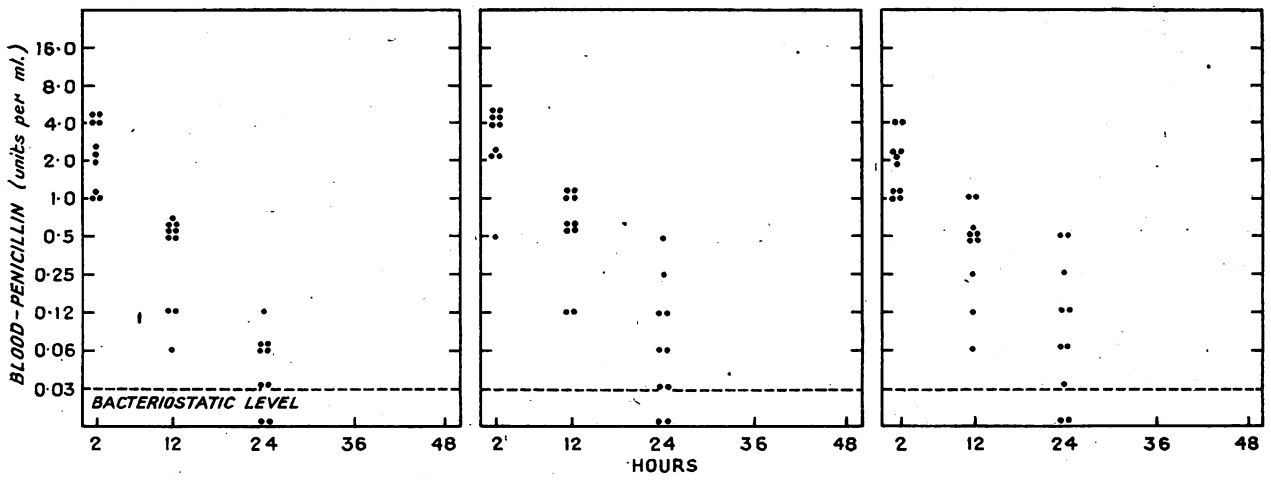

Fig. 2—Blood-penicillin levels in children after a single intramuscular injection of procaine penicillin: group 4, aged 1-12 months (100,000 units); group 5, aged 1½-3 years (150,000 units); group 6, aged 4-9 years (300,000 units).

Penicillin has been used widely in the first month of life to treat existent infection and as a prophylactic after a difficult labour with evidence of atelectasis or inhalation of amniotic contents, and also in the small premature infant liable to respiratory infection. Henderson and McAdam (1946) and Moseley (1948) have shown that penicillin given by mouth is efficient in the first month of life. In many cases, however, it is necessary to give the penicillin parenterally because of persistent vomiting due to cerebral irritation following a difficult delivery, to congenital anomaly, or to infection outside the alimentary tract. The parenteral route is also that used in congenital syphilis. In view of the small size of the patient and the need for complete rest a reduction in the number of injections is eminently desirable. In older children too the advantages of a single daily injection are obvious, and the saving in the nurses' time is considerable.

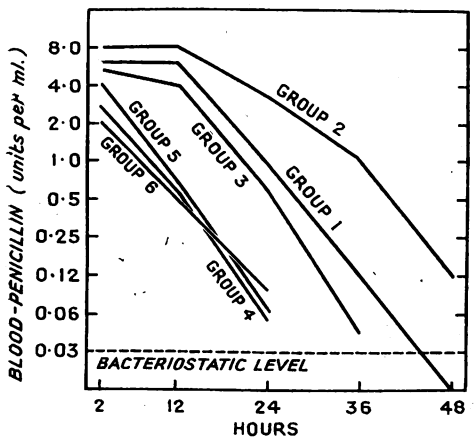

Fig. 3—Curves obtained by plotting median points on figs. 1 and 2.

COMBINED TREATMENT WITH PROCAINE PENICILLIN AND SULPHONAMIDES

Penicillin and sulphonamides are used together much more commonly in the treatment of infections in children than in adults; they are used especially in children to treat mixed infections and when the sensitivity of the infecting organism in a desperately ill child is unknown. In view of the increasingly widespread use of procaine penicillin in pædiatrics it is necessary to consider possible antagonism between the two drugs. Woods (1940) has demonstrated in vitro the antagonism exerted by procaine to the bacteriostatic action of sulphonamides, and a similar effect in vivo has been shown by de Waal et al. (1942). A dose of 300,000 units of procaine penicillin contains 120 mg. of procaine, theoretically enough to counteract a blood-sulphonamide level of 2 mg. per 100 ml. This quantity, however, is slowly absorbed over twenty-four hours; and, since the *p*-aminobenzoic acid formed from it is rapidly excreted in the urine (Burgen and Keele 1948), the amount of this substance present in the body is probably insignificant. Further experience of combined therapy will be necessary to show whether this theoretical antagonism is of importance, and whether the small quantity of procaine affects the action of sulphonamides given concurrently in therapeutic doses. Carson et al. (1949) suggest that, until this has been decided, ordinary penicillin should be used in preference to the procaine salt for combined therapy.

SUMMARY

Procaine penicillin G in the form of a suspension in arachis oil for intramuscular injection is a valuable addition to the pædiatrician's therapeutic weapons.

In babies a dose of 100,000 units produced therapeutic blood-penicillin levels for at least twenty-four hours, and in the period immediately after birth for considerably longer.

In older children a dose of 150,000–300,000 units produced therapeutic blood levels of penicillin lasting for at least twenty-four hours in 23 out of 29 patients.

It is advisable not to combine procaine-penicillin therapy with sulphonamide therapy until more is known about the antagonism between procaine and sulphonamides.

We are indebted to Prof. D. M. Dunlop and Prof. R. W. B. Ellis for their advice and criticism; to Professor Ellis and Dr. D. N. Nicholson for permission to carry out this investigation in the wards under their charge; to Mr. James Dick for much technical assistance; and to Glaxo Laboratories Ltd. for supplying procaine penicillin.

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Preliminary Communication

CHLOROMYCETIN* IN TYPHOID FEVER

THE chance observation, by Smadel and Lewthwaite[1] during a trial against scrub typhus in Malaya, that 'Chloromycetin' had a dramatic effect on typhoid fever has been confirmed by Woodward et al.[2] So far there has been only one report of the use of the drug, on a case of typhoid in the United Kingdom,[3] but a more comprehensive trial under controlled conditions has been in progress. The present announcement, made at the request of the Editor of THE LANCET, is intended to satisfy the very natural curiosity concerning a drug which promises to revolutionise the prognosis of typhoid fever and may contribute much towards the eradication of enteric fever as an endemic disease in these islands.

DESIGN OF TRIAL

In planning these investigations the following matters were considered:

(*a*) There is a wide variation in the virulence of different strains of *S. typhi*. In some outbreaks the illness is uniformly severe and the mortality high; in others the disease is mild, ambulant cases are frequent, and fatality-rates low. Clinical states are influenced by previous inoculation. Unless a very large series of cases is treated a fair assessment of the value of a treatment of typhoid is most likely to be obtained when the cases treated have been infected from the same source.

(*b*) In the past the prognosis of typhoid has been largely influenced by the quality of the nursing. There is great variety in the techniques used in the general management of the disease, and the influence of these variations cannot be assessed in a short series. The cases in a trial should therefore receive the same management, the administration of the drug being the only controlled variable. Assessment should be undertaken by one group of observers.

(*c*) Even at risk of wasting drug on mild cases a strict "alternate case" selection should be used. In the present investigation selection depended on the time of admission to hospital.

(*d*) The diagnosis should be adequately confirmed.

CLINICAL MATERIAL

On April 15, 16, and 19, 1949, an aliment infected with *S. typhi*, Vi bacterophage type E.1., was on sale in the village of Crowthorne, Berkshire, and was consumed by some of the inhabitants during this period. Consequently at least 37 persons developed typhoid fever with onset between April 21 and 28. The first notification to the public-health authorities was not made until April 30.

The patients were removed to several hospitals. In two hospitals only were the numbers sufficient and did the circumstances satisfy the conditions of the trial. These were the Victoria Infectious Diseases Hospital, Winchester, and the South Middlesex Infectious Diseases Hospital at Mogden. The numbers of cases admitted were 13 and 9 respectively and the drug available was applied to the treatment of 6 and 4 respectively.

In all cases the diagnosis had been confirmed bacteriologically by Dr. Norman Wood of the Public Health Laboratory Service, Reading.

RESULTS

At the time of writing (May 16) several of the patients are still in the third week of disease and it would be premature to attempt any scientific evaluation of the drug's effects. Nevertheless the following statements are justified.

Two very elderly patients died soon after admission to hospital: one was in the treated group and one in the control. In all the remaining 9 treated patients signs of resolution were obvious within 48 hours (i.e., after the administration of 8 grammes of the drug); 7 were apyrexial by the third day of treatment and the other 2 had normal temperatures throughout the fourth and fifth days respectively after treatment started. Thereafter resolution has been complete in all.

By chance the more severe cases had fallen into the treated group. In 4 patients in the control group, which included some immunised men, resolution of temperature, in relation to the day of disease, occurred before the fever had ceased in the treated patients. In other untreated patients the disease continued to run its usual course and there are signs of relapse in 3. It is too early to comment on the effect on complications, but Smadel (personal communication) reports that hæmorrhage and perforation can occur in treated cases.

Constitutional disturbance was affected rather more rapidly than the temperature, the influence on the severe headache of typhoid being dramatic. One patient asserted that the drug was a better headache cure than aspirin!

DISCUSSION

Other investigations are in progress and more comprehensive reports will be made in due course. Drs. Good, Grumble, Lewthwaite, Rankin, and Stanley White have undertaken clinical observations. Drs. Cann, Felix, Mackenzie, and Wood are making bacteriological studies, including observations on the clearance of blood, fæces, and urine, and Sir Alexander Fleming is investigating the biological assessment of drug levels in the blood. It will be several weeks before the results can be published.

There is every reason to believe that the extremely encouraging results obtained by Woodward will be confirmed by the present investigations.

An unfortunate feature in the present series has been the delay in the initial diagnosis and, consequently, in admission to hospital of many of the patients. The advantages of chloromycetin cannot be fully explored or exploited until the effect on cases in the first week of disease is measured. This applies particularly to the incidence of complications and the influence of the drug on the persistence of the carrier state.

The drug will remain in short supply for some time and is very expensive in dollars. Early treatment will certainly add enormously to the comfort and safety of patients and may also effect considerable economy.

A plea is made for earlier diagnosis. Enteric fever should be suspected and the bacteriologist consulted whenever unexplained fever persists for four or more days.

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Senior Medical Officer, Ministry of Health.

* Chloramphenicol (Parke Davis).

1. Smadel, J. E., Lewthwaite, R., Savoor, R. *Science*, 1948, **108**, 160.
2. Woodward, T. E., Smadel, J. E., Lee, H. L., Green, R., Mankikas, D. S. *Ann. intern. Med.* 1948, **29**, 131.
3. Murgatroyd, F. *Brit. med. J.* 1949, i, 851.

"Demographers are agreed that for the maintenance of our population size the average size of a family should be 2·5, which means that many must produce three, four, and five. All things considered it would seem that the majority of married couples should be encouraged to produce three children whilst the mother is still young, and that those who together with their early offspring display an extraordinary healthiness should be encouraged to produce additional children. If families of more than four are not to be encouraged then it would appear that not less than 50 per cent. of parents with one, two, or three children would have to produce an additional child if the total population size is to be maintained."—Prof. F. A. E. CREW, F.R.S., *Brit. J. soc. Med.* 1949, **3**, 1.

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Reviews of Books

Rational Medicine

JOHN W. TODD, M.D. Lond., M.R.C.P., assistant physician, Farnham Hospital. Bristol: John Wright & Sons. 1949. Pp. 378. 25*s*.

Dr. Todd is distressed by the sum of iatrogenic ill health for which the exalting of signs over symptoms, faith in diagnostic machines and tests, zealous pursuit of precise diagnosis, and unwarranted belief in the efficacy of "early detection and prevention" are largely responsible. He has observed the irrationality of much accepted therapy and the still common reluctance to give the mind its due as a begetter of symptoms and morbid states. For him "the most important ultimate object of medicine is the removal or prevention of real positive symptoms" and on this basis he proceeds to a valuation of symptoms and their analysis, signs and their interpretation, treatment by régime, diet, drugs, removal of foci of infection, physiotherapy and psychotherapy, and medical prophylaxis. The materialistic mismanagement of those whose sickness is their souls gives him material for "The Black Chapter of Medicine"; and constipation gets a chapter to itself. Dr. Todd finds it necessary to scale down, by much or little, almost every physical sign or test he mentions and many of the therapeutic systems, methods, and agents in common use. In cardiology, for instance, not only murmurs and cardiograms but cardiac impulse, rate, and quality of pulse and exercise-tolerance test are devalued in turn, and we are left with the patient's account of his response to exertion as the best criterion of cardiac efficiency—fair enough if only the subject is a willing, accurate, and candid witness. In therapeutics, rest for tuberculosis and cautious feeding after Rammstedt's operation are not less discredited than removal of septic foci and avoidance of strain. Symptoms, judiciously weighed and interpreted, are commended as the surest means to diagnosis; meticulous physical examination when the symptom-complex suggests neurosis is deprecated, its place being taken by a therapeutic speech of explanation and encouragement with a firm farewell at the close.

The purpose and main thesis of this book command approval: we need to be reminded that "experience is deceitful and judgment difficult." and urged to "prove all things" and "above all to do no harm." But Dr. Todd is not a persuasive advocate; he puts his case laboriously and ex cathedra, he flogs his good horse. Not all his conclusions can be accepted on the evidence he provides; moreover, there are limits to the possibility of rational medicine in a world of highly irrational men and women. Neither author or publisher tells us for whom the book is intended, but it could be usefully pondered by those responsible for planning medical education.

Gods and Men

Sir RICHARD GREGORY, F.R.S. London: Stuart & Richards. 1949. Pp. 214. 12*s*. 6*d*.

No writer is better equipped to be the spokesman of contemporary science than Sir Richard Gregory. He was for many years editor of *Nature*, and in 1949 became president of the British Association. He traces progress from the days of ancient Egypt to the present, but his main emphasis is on ancient, rather than on modern, science. His interest in religion is that of the humanist. Religion, literature, and art are expressions of the human spirit and are necessary therefore for the development of mankind. "Humanism, in the sense in which it is now best understood, is the integration of all human influences which promote the development of the human race, whether it includes the teaching of a particular religion or not." It is for science and religion to coöperate in this humanistic service, each in its own field of action and each in its own way. Fortunately the chief obstacle to the acceptance of any religion—namely, the previous strict determinism in science, has now been removed. Thanks to the recent advances in physics, "mechanistic principles no longer dominate scientific thought." The gap which once separated the exact and descriptive sciences from religion and philosophy has now, in the author's opinion, been bridged; so a sounder and more philosophical view of mechanism in nature can be taken. Sir Richard has an extensive knowledge of ancient scientific ideas, and it is the part of his book which deals with these that his readers will find most interesting. The sections in which philosophy and religion are discussed are less satisfactory; but they have been written with scrupulous honesty and a desire never to pass an unsympathetic judgment on men's religious aspirations and philosophical conclusions.

Medical Photography

(4th ed.) T. A. LONGMORE, F.S.R., A.R.P.S. London: Focal Press. 1949. Pp. 1012. 50*s*.

THIS may be considered almost a new work, for in the four years which have elapsed since the last edition medical photography has made great strides, and the book has kept pace. Since it is the only book of its kind in existence, no comparisons are possible. It certainly has great value; but it could still be improved. Mr. Longmore, perhaps in attempting too much, has been forced to omit many practical details. Though the volume is divided into distinct parts on radiography and medical photography, there is also what amounts to a textbook of pure photography within its covers. This imparts a somewhat theoretical flavour, and cramps the practical instructions. As a reference manual for practising medical photographers it falls short in detail, whereas it is unnecessarily complex for radiography students.

Since increasing demands are being made for colour work, the section on colour photography is specially interesting. It has always been exacting and complicated, except for those who are satisfied to expose a roll of film and hope that the manufacturers will produce some sort of result. The author wisely considers some of the different types of film available and the factors which influence colour balance. The techniques of illumination and exposure are dealt with quite separately, and the chapter concludes with an outline of colour-printing methods. Only a few departments think it worth undertaking colour-printing of medical subjects, but more interest may be shown when it becomes possible to provide separate colour darkrooms. This section of the book is illustrated with fair-sized colour blocks.

Standardisation of technique is fully discussed—an unfailingly popular topic among a section of medical photographers. The illustrations are profuse and of reasonable quality, and in addition there are many tables indexed separately for quick reference.

Die Aesthetik der Nase (Vienna: Maudrich. 1949. Pp. 87. Sch. 21.).—This short book by Dr. Alfred Berndorfer describes the diagnosis and treatment of deformities of the external nose. It cannot be described as a very serious or original contribution to this subject.

Mostly Memories: Some Digressions (Edinburgh: C. J. Cousland & Sons. 1949. Pp. 360. 15*s*.).—Dr. William Guy must have a prodigious memory to recall so many details of his long, eventful, and distinguished career. Not content with his lucid prose, he breaks out into verse occasionally, generally with happy results. Though he began by qualifying in medicine, it was really when he embarked on dentistry that his life-work started. His pen pictures of the Edinburgh professors of his earlier days are remarkably accurate and often witty, but always generous. The hard life of the average Scottish student of that period is by no means overdrawn.

A Dictionary of Scientific Terms (4th ed. Edinburgh and London: Oliver and Boyd. 1949. Pp. 480. 32*s*.).—The scope of this dictionary, compiled by I. F. and W. D. Henderson and J. H. Kenneth, is indicated by the subtitle *Pronunciation, Derivation, and Definition of Terms in Biology, Botany, Zoology, Anatomy, Cytology, Embryology, Physiology.* It omits items of systematic nomenclature such as genera, orders, and species. The text of the third edition has been revised considerably, and some two thousand terms have been added. A new feature is a list of equivalent units of measurement, which leaves out the ton and includes the strange term "one degree of latitude at the equator."

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THE LANCET

LONDON: SATURDAY, MAY 21, 1949

Disability through Neglect

THE detective side of medicine—investigation and diagnosis—has such charms that many doctors never get over their early preoccupation with it. Treatment makes a poor second; for while it is fascinating to decide cleverly what has gone wrong with the patient it is often difficult and tedious to get him better. Nowadays we talk freely of reablement (and even more freely of "rehabilitation"); but in fact those who undertake this work are few, while those who recognise its absorbing interest are perhaps fewer. Disablement is a long-term trouble, and we have agreed to think long-term troubles dull. Yet even at the detective level they present great claims. To be disabled is a massive experience: the mind suffers with the body, and every disabled patient presents, in current jargon, a psychosomatic problem. The doctor who attempts to fit him for life again must be good at more than anatomical diagnosis, more than structural repairs.

The results of sound reablement have an effect on national life and economy; and it is thus a duty of the Ministries of Health and of Labour to encourage a greater interest in its practice. For, despite some good work, hospitals are on the whole apathetic, and do not provide adequately for the treatment and prevention of disabling conditions. In the analysis, this means that the physicians and surgeons on the hospital staffs are not sufficiently interested. Yet it is as much their duty to study the effects of disabling illnesses and injuries, and to devise means of counteracting those effects, as it is to provide expert early diagnosis and treatment. In a circular addressed to every regional hospital board, hospital management committee, and board of governors in the country, the Ministry of Health reminds us that while it is the task of the Ministry of Labour to resettle the disabled in suitable work, and to give them vocational training and guidance where necessary, it is for the National Health Service, through the hospitals, to ensure that they get the medical treatment and reablement which will fit them for such training. As a result of neglect, at one stage or another of treatment, there is now a vast amount of preventable disability in the country; and many of the injuries and disorders so neglected were trivial at the outset. There is also much unnecessary disablement through ill-directed convalescence; for disability neuroses, too, can originate in relatively minor disorders if these are badly managed. The small group of people whom it is almost impossible to settle in work usually have a history of this kind, and need expert medical or psychiatric help. In hospitals which run good reablement departments it is found that, whether the original trouble is grave and likely to be permanently disabling, or slight, early reabling measures and expert guidance during convalescence hasten recovery, reduce permanent disability, and shorten the time away from work. "Expert guidance" means something more than skilled management of the disability itself. Dr. D. RUSSELL DAVIS, on another page, notes how flat and aimless occupational therapy seems to patients who have no clear objective before them. He points out that—anyhow in cases of peripheral nerve injury—it is possible to predict, at the start of treatment, the degree of residual disability closely enough for the patient with the advice of his surgeon and the disablement resettlement officer (D.R.O.) to decide on his future employment. Once this has been done, occupational therapy gains his interest and becomes a means to an end. The patient uses his injured limb in movements which he will use later at work; and active movement restores function as nothing else can.

All this experience places a direct responsibility on doctors dealing with an actually or potentially disabled patient—a responsibility which the circular clearly defines:

> "... every practitioner who has the care of serious and disabling complaints must assume responsibility for seeing his patients through to the point where they can either resume their former employment or be passed to the D.R.O. for placing in some suitable alternative occupation. The responsibility for assessing disability and advising on residual capacity and suitable conditions of work belongs to the medical practitioner; the responsibility of placement in work rests with the D.R.O."

The circular points out that some 300 hospitals now have good equipment for physical reablement, and that more and better equipment should be provided as soon as further quarters and trained staff can be found. Occupational therapy, too, should be developed, and along lines which will relate it to the employment offered in local industries. But these, the circular insists, are not the chief need: if reablement is to become a recognised part of hospital treatment, a single responsible member of the medical staff should be nominated to supervise the service. He would usually be the specialist in physical medicine, or one of the physicians or surgeons specially interested in the subject, and his duties should include the training of the reablement team. He would likewise supervise the programme of reablement arranged for each patient, confer with the D.R.O. about those needing vocational guidance, and keep in touch with general practitioners referring patients to his department. He would also doubtless have his place on the medical interviewing committees which the Ministry recommends should be set up. These committees, which have been tried successfully, will give medical advice to patients and the D.R.O. in cases where resettlement is proving difficult on medical grounds; and they will include, besides a member of the hospital staff with special knowledge of reablement, a general practitioner who knows the local industries. The hospital almoner and the D.R.O. would also attend.

As a preliminary in these practical measures the Ministry suggests that every regional hospital board should appoint a small committee, with which the regional psychiatrist should be associated, to survey the problem in the region and advise on the reablement services available and the possibilities of development.

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Iatrogenic Epilepsy

OFTEN a careful history and physical examination fail to reveal the cause of epileptic attacks; and for diagnosis it may be necessary to observe the mode of onset and the pattern of the fit. Fits have long been induced artificially, both for this purpose and to test susceptibility. Three methods have been used: hyperventilation, hydration, and the exhibition of a convulsant drug in doses that would not cause convulsions in non-epileptic subjects. Hyperventilation is rarely successful; while hydration, though more effective, is also more unpleasant, and the time of the resulting fit is uncertain. Convulsants have the drawback that doses which are subconvulsive to normal subjects may also fail to produce a clinical convulsion in an epileptic. With the introduction of electro-encephalography these diagnostic tests have been made less severe; for hyperventilation may cause characteristic electrical changes without a clinical attack.

American workers have now carried "activation electro-encephalography" a stage further. Two aims underlie their studies: first to devise a test that is pathognomonic of epilepsy, if possible distinguishing between "idiopathic" and "acquired" epilepsy; and secondly, with acquired epilepsy to demonstrate the focus in the brain from which the attack originates. So far the most successful attempts to solve these two problems have been made with similar techniques. A convulsant, leptazol, is slowly injected intravenously in doses up to a maximum of 400 mg.; when electrical changes appear in the record, the injection of leptazol is stopped and replaced by phenobarbitone or some other anticonvulsant. With this technique KAUFMAN and his co-workers [1] in Massachusetts have demonstrated the focus in 45% of 97 cases of post-traumatic epilepsy; and by repeating the test this figure was increased to 56%. With idiopathic epilepsy, however, the results are less satisfactory: CURE and JASPER [2] at Montreal report that in half of a small group of idiopathic epileptics with normal or borderline encephalograms, leptazol produced electrical and clinical seizures; but after a similar injection 4 out of 27 non-epileptics with normal electro-encephalograms had epileptic changes in the record. Leptazol appears to be valuable in demonstrating the presence of an epileptogenic focus; but in diagnosing the doubtful case of idiopathic epilepsy it is apparently no more helpful than hyperventilation and hydration. Rhythmic photic stimulation, which has lately been described by GREY WALTER,[3] may prove a suitable alternative; but the clinical value of this technique cannot yet be gauged.

Artificially induced fits are equally important in the selection of anticonvulsant drugs. To investigate the stream of new and modified drugs with suspected anticonvulsant activity, the pharmacologist would like to produce in the laboratory a test situation in which success correlates highly with clinical efficacy; but so far idiopathic epilepsy has not been simulated experimentally. However, MELLANBY'S [4] discovery of the effect on animals of agenised flour holds great promise; for the signs of intoxication with this substance closely resemble those of epilepsy in man. SILVER and his colleagues [5] have shown that dogs with signs of intoxication have electro-encephalograms very similar to those found in epilepsy; and these authors [6] also report that thiopentone or 'Trimethadione' effectively controls "agene" convulsions. At least three groups of workers are now trying to isolate the toxic principle in agenised flour. Its isolation would help indirectly in the search for new anticonvulsants; and it would help to decide once and for all whether flour prepared in this way is harmless to man.

1. Kaufman, C., Marshall, C., Walker, A. E. *Arch. Neurol. Psychiat.* 1947, **58**, 533.
2. Cure, C., Jasper, H. *Ibid*, 1948, **59**, 691.
3. Walter, V. J., Walter, W. G. *Electroencephalography clin. Neurophysiol.* 1949, **1**, 567.
4. Mellanby, E. *Brit. med. J.* 1946, ii, 885.
5. Silver, M. L., Monahan, E. P., Klein, J. R., Pollock, G. H. *Arch. Neurol. Psychiat.* 1949, **60**, 405.
6. Silver, M. L., Monahan, E. P., Klein, J. R. *Proc. Soc. exp. Biol., N.Y.* 1947, **66**, 410.
7. Altmeier, W. A. *Ann. Surg.* 1948, **128**, 708.
8. Tillett, W. S., Cambier, M. J., McCormack, J. E. *Bull. N.Y. Acad. Med.* 1944, **20**, 142. Jawetz, E. *Arch. intern. Med.* 1946, **77**, 1. Zubrod, C. G. *Bull. Johns Hopk. Hosp.* 1947, **81**, 400.
9. Romansky, M. J., Rittman, G. E. *Science*, 1944, **100**, 196.
10. Boger, W. P., Flippin, H. F. *J. Amer. med. Ass.* 1949, **139**, 1131.
11. Salivar, C. J., Hedger, F. H., Brown, E. V. *J. Amer. chem. Soc.* 1948, **70**, 1287. Sullivan, N. P., Symmes, A. T., Miller, H. C., Rhodehamel, H. W. jun. *Science*, 1948, **107**, 169.

Prolonged Penicillin Action

To reduce the unpleasantness of penicillin treatment and extend its usefulness to ambulant patients, three plans have been devised: delayed absorption; delayed excretion; and oral administration. Lately, too, it has been suggested [7] that in staphylococcal or streptococcal infections of moderate severity intramuscular injections of 100,000–200,000 units of penicillin in aqueous solution every 8–12 hours may be effective, because the bacteriostatic action of penicillin apparently persists for some time after it can no longer be detected in the blood.[8] In the early days of penicillin therapy, the retarding effect of applying an ice-bag to the site of injection was tried, but this was soon superseded by the preparations which delay absorption. The method most commonly used up to the present has been that of ROMANSKY and RITTMAN,[9] which consists in the intramuscular injection of calcium penicillin in beeswax and peanut oil. Although at the time of its introduction this was a great advance in prolonging penicillin blood-levels, it has some disadvantages. The beeswax is not always completely absorbed, and both the beeswax and the peanut oil occasionally give rise to reactions and cause soreness at the site of injection. With this preparation reactions have been found in about 10% of patients. Fluidity of the preparation at room temperature has been difficult to attain, but newer preparations are much improved in this respect. It now seems that the need for beeswax can be removed by combining penicillin with aluminium or with procaine, to form relatively insoluble salts. The retarding effect of aluminium on the absorption of injected substances may also be made use of by suspending crystalline penicillin in a gel consisting of aluminium stearate in peanut or sesame oil, and BOGER and FLIPPIN [10] find this more effective than combining penicillin and aluminium in the same molecule. By suspending procaine penicillin in such a gel they obtained measurable amounts of antibiotic activity in the plasma for 4–6 days after a single injection of 300,000 units.

Procaine penicillin G, which was introduced [11] in the United States last year, is a crystalline substance

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prepared by combining a molecule of procaine base with a molecule of sodium penicillin; its potency is about 940 units per ml. Little has so far been published on its use in this country. Six months ago JONES and SHOOTER [12] reported the effect of a single daily injection of 1 ml. of procaine penicillin in peanut oil which contained 300,000 units of penicillin. EMERY and his colleagues [13] gave procaine penicillin in peanut oil daily to 50 children and concluded that the penicillin blood-levels after 24 hours were extremely variable and that this was not an ideal preparation for administering penicillin by daily injections in children. In this issue YOUNG and his colleagues have studied the effects of three preparations of procaine penicillin: (1) in peanut oil, (2) in water, and (3) in peanut oil with aluminium stearate. Their object was to find a depot preparation which would ensure a blood-level of 0·06 unit per ml. or over 24 hours after a single small injection. They chose three classes of subjects for this investigation: healthy members of the staff of their department; ward patients with a variety of diseases (excluding any cases with impaired renal function); and ambulant patients with gonorrhœa attending the venereal-diseases clinic. In all, 185 people received the procaine penicillin G; preparations containing crystals 5–20 microns in diameter were preferred to the coarse-particle preparations (60 μ) which were found to clog the needle and syringe. With a dose of 600,000 units of this penicillin preparation all subjects had a blood-level of 0·06 unit per ml. or over at 20 and 24 hours. The oily preparation produced no better results than the aqueous suspension. However, when aluminium stearate was incorporated in the oily preparation, 64 out of 65 cases showed a blood-level of 0·06 unit per ml. or over at 24 hours after only 300,000 units. The aluminium stearate,[14] which is a water repellant, seems particularly effective in delaying the action of procaine penicillin. In 8 patients who received a single injection of 2,000,000 units of procaine penicillin in oil with aluminium stearate, the blood-levels ranged from 1 to 2 units per ml. at 24 hours, followed by a gradual daily decline to zero on the 6th to 8th day.

Also in this issue WILSON and others report on the use of procaine penicillin in babies. They used procaine penicillin G in peanut oil in which over 60% of particles were 15–50 μ in diameter. They found this preparation was suitable for babies and young children, and selected 10 patients from each of the following groups for trial: premature infants; infants aged 1–5 days; infants aged 7–15 days; children aged 1–12 months; children aged $1^1/_2$–3 years; children aged 4–9 years. The first three groups were all healthy, while the remainder were mostly recovering from acute infections. The dose of procaine penicillin was graded from 60,000 units in the youngest to 300,000 units in the oldest group, one injection only being given. In babies 100,000 units produced therapeutic blood-levels for at least 24 hours, and in the newborn these levels were maintained for considerably longer, owing, it is suggested, to the period of physiological dehydration following birth. In the older children 150,000–300,000 units produced therapeutic blood-levels lasting for at least 24 hours in 23 out of 29 patients.

A different method of tackling the problem is by the inhibition of penicillin excretion in the urine by such drugs as *p*-aminohippuric acid and, more recently, caronamide.[15] The necessity for the intravenous injection of the former severely limits its use; the latter can be given by mouth but may cause transient albuminuria and nausea in the advocated dose of 4 g. 4-hourly and is still something of an unknown quantity. The particular value of caronamide as an adjunct to penicillin therapy is that it not only prolongs the action of penicillin but increases the blood-levels attainable with a given dose, which is especially useful in conditions where very resistant bacteria are entrenched in tissues with a poor blood-supply, as in bacterial endocarditis.[16] Where such very high blood-levels are not required it seems that procaine penicillin in an aluminium stearate gel will prove to be the least toxic and most effective preparation for prolonging penicillin action.

The Amending Bill

THE Minister of Health has now laid before Parliament his long-awaited Bill for amending the National Health Service Acts of 1946 and 1947. As it was largely the promise of this Bill, and of its safeguards, that last year induced the medical profession to accept the new service, the text is certain to be closely scrutinised. Let it be said at once that the Minister has fully kept faith; for all the promises made a year ago are here translated into legal form. Clause 10 makes it impossible to change by regulation the general practitioner's remuneration and to make it "consist wholly or mainly of a fixed salary which has no reference to the number of patients for whom he has undertaken to provide . . . services," while clause 11 forbids "any requirement that all specialists employed for the purpose of hospital and specialist services shall be employed whole-time." Besides these clauses, and those concerned with partnership agreements, the Bill contains a number of additions and changes thought necessary in the light of experience of the working of the Acts.

In clarifying the position of partnerships, the Bill deals first with partners who before the appointed day had entered into agreements providing for the sale and purchase of further shares in their practice. When these transactions take place, the partner from whom the share is transferred will straightway receive the share of the compensation attributable to the portion transferred. The position of mixed partnerships (where some of the partners have joined the service and others have not) is also clarified, and appropriate methods are provided for transferring the share of a retiring or deceased partner to the remaining partners. As there may be practices where, if the new provisions had appeared in the original Act, one or more of the partners would not have decided to stay out of the service, it is now to be enacted that any such doctor will, for the first two months after the passing of this Bill, have a renewed option to join the service and receive compensation for the goodwill of his practice. Turning to disciplinary machinery, the

12. Jones, P. F., Shooter, R. A. *Brit. med. J.* 1948, ii, 933.
13. Emery J. L., Stewart, S. M., Stone, D. G. H. *Ibid*, 1949, i, 845.
14. Robinson, J. A., Hirsh, H. L., Milloff, B., Dowling, H. F. *J. Lab. clin. Med.* 1948, **33**, 1232.
15. Leading article, *Lancet*, 1948, i, 70.
16. Loewe, L., Eiber, H. B., Alture-Werber, E. *Science*, 1947, **106**, 494.

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Bill allows for a wider choice of the professional member who serves on the tribunal: there is to be a panel of not more than six members of the medical profession, from whom the one most appropriate to the particular case under examination may be chosen. Important, too, is a clause that enables an executive council to remove from its list the name of a practitioner who "has never provided or has ceased to provide general medical services for persons in that area": when the Acts of 1946 and 1947 were drafted it was apparently not foreseen that executive councils, besides having power to place a doctor's name on their list, might also need to remove his name if he failed to set up in practice, or ceased to practise in their area. Other minor amendments to the Acts have the effect of regularising promises already given. Thus, money may be provided by statutory levy from the practitioners' fund for the administrative expenses of the local medical committee (including in these expenses travelling and subsistence allowances to members of the committee). The executive councils may in future choose their own chairman, instead of accepting a nomination from the Minister.

Altogether there is little in the Bill that is unexpected or disputable. It is unlikely to arouse much controversy, or take up much Parliamentary time, unless its passage through Parliament is used as an opportunity for introducing other amendments on which the same measure of agreement has not yet been reached.

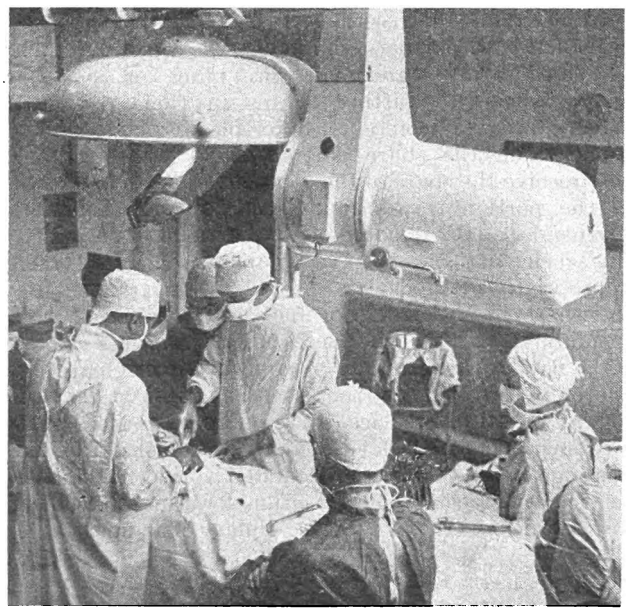
Annotations

TELEVISION IN THE OPERATING-THEATRE

EIGHTEEN months ago news was received that television had been successfully used in the U.S.A. for demonstrating operative technique [1]; and last week a display at Guy's Hospital, London, left no doubt that this is an important new medium of instruction. The installation, devised jointly by Electrical and Musical Industries Ltd., and the hospital's department of surgery, is believed to be the first permanent one of its sort in the world. As the accompanying picture shows, the television camera is built as a unit with the overhead light; and this unit, which also contains a microphone, can be moved at will along an overhead railway. From a control-room in the gallery, sound and picture are transmitted over a closed circuit to several different viewing-points; and by remote control it is possible to select any of three magnifications, the largest of which gives a threefold magnification of an area about 5 in. by 6 in. Seen from a distance of some 15 ft. at the back of a lecture-theatre, this magnification provided an astonishingly detailed picture—indeed a much larger and clearer picture than is vouchsafed to most galleryites. The mirror, by which the image is transmitted to the camera, is immediately above the operation field, so giving the viewer an angle of vision normally gained only by the surgeon and his assistant. The operation demonstrated last week was appendicectomy; but a surprisingly clear view is said to have been obtained in deep fields where the surgeon himself is in danger of losing binocular vision. The monochrome of television might at first seem a grave drawback. This has, however, not defeated the electrical experts, who, finding that most fields of operation are a study in pink or red, have improved the differentiation at this end of the spectrum.

The demonstration made it clear that the floors of operating-theatres need no longer be thronged with watchers thankful for a brief and uncertain glimpse of the surgeon at work. Soon surgeons in Britain are to be invited to see the Guy's installation for themselves.

1. See *Lancet*, 1947, ii, 802.



POTASSIUM IN DIABETIC COMA

OF late years attention has been attracted to changes in the serum-potassium level during treatment of diabetic coma. Holler,[1] for example, has recorded a low serum-potassium content associated with paralysis, which responded satisfactorily to administration of potassium salts; and now Sinden and others [2] describe 6 cases in which low serum-potassium values were found during treatment. None showed any manifestations of paralysis. In 2 of the patients, who were initially dehydrated, the potassium level was at first high but fell during treatment. All the patients showing a sharp fall in potassium had received, as well as insulin, large doses of glucose; and it might be concluded that this fall is due to the passage of potassium from the serum into the muscles and liver. However, Danowski and his co-workers,[3] who have carried out extensive studies on the metabolism of potassium salts in diabetic ketosis, suggest that the low serum level in treatment is due mainly to a dilution effect by expansion of the extracellular space of the body, and to continued loss of potassium in the urine. They found that with diabetic ketosis large amounts of potassium administered either by mouth or parenterally are retained by the body. According to Tarail and Elkinton,[4] in normal persons only small amounts are retained, and loss of potassium in the urine continues even with a low serum-potassium level.

The implications of these results are not quite clear. Probably, however, potassium may be given with advantage to patients recovering from diabetic coma. (Govan and Darrow [5] have claimed pronounced improvement from including potassium salts in the fluids administered to infants with diarrhœa and dehydration in whom there is potassium deficiency.) A suggested dose in

1. Holler, J. W. *J. Amer. med. Ass.* 1946, **131**, 1186.
2. Sinden, R. H., Tullis, J. L., Root, H. F. *New Engl. J. Med.* 1949, **240**, 502.
3. Danowski, T. S., Peters, J. H., Rathbun, J. C., Quashnock, J. M., Greenman, L. *J. clin. Invest.* 1949, **28**, 1.
4. Tarail, R., Elkinton, J. R. *Ibid*, p. 99.
5. Govan, C. D., Darrow, D. C. *J. Pediat.* 1946, **28**, 541.

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diabetic coma is 2 g. of potassium phosphate plus 0·4 g. of potassium dihydrogen phosphate intravenously, or 100 ml. of 2% potassium chloride intravenously; but administration by mouth is definitely safer. With dehydration and oliguria there is serious risk that the serum-potassium level may be high; such intravenous doses might then prove dangerously toxic, and if this route is used careful check of the urine output and the electrocardiographic findings will be needed.

LEPROSY IN THE EMPIRE

OF the 7 million known lepers in the world nearly half are British subjects. Even in England, it seems, there are more cases of leprosy than there have been for some centuries; and Dr. Gordon Ryrie, medical secretary of the British Empire Leprosy Relief Association (BELRA),[1] notes that the numbers here are steadily increasing, partly through the return of infected soldiers and prisoners-of-war from the Eastern theatres of war, partly because more British and Eurasians are entering the country from India and Pakistan, and partly because there are far more foreigners here than there were before the war. Not to arouse alarm, but merely to show how ill equipped we are nowadays to deal with this ancient disease, he cites the case of a patient now working as a waiter in a well-known London restaurant. We need, he considers, a section in a modern hospital where patients could be treated under a whole-time leprosy expert supported by a laboratory research team, and where new drugs could be evaluated, and doctors and nurses trained in the care of the disease. It is reassuring to know that the Minister of Health has it in mind to make leprosy notifiable (see p. 884), and is arranging for a leper hospital, to supplement the solitary one at Chelmsford, to be provided as part of the National Health Service.

Important as must seem this need at home, it is, of course, a trifle compared with the leprosy problem seen as a whole. The BELRA exhibition, now showing at 167, Oxford Street, reveals its mere extent, as well as something of its meaning in terms of wretchedness. Much has been done by the association, which was founded 25 years ago through the agency of Sir Leonard Rogers, Sir Frank Carter, and the Rev. Frank Oldrieve. Much may be hoped in the future from 'Sulphetrone,' which may mean arrest in 9 out of 10 cases treated in good time. Social advances, too, will make a difference. Leprosy, as the exhibition shows vividly by photographs and statistics, attacks those who are already weakened by other disorders and infections, and whose diet is defective. Better living conditions and better food for the native population of the Empire would do much to reduce the incidence of leprosy. Neglect of the disease leads to great and unnecessary destruction—to anæsthesia and trophic ulcers, or to induration of the skin with formation of leprous nodules. Agonising in the early acute stages, nerve leprosy becomes chronic, painless, and deforming; it does not kill—the patients usually die ultimately of renal disease or tuberculosis. Every advanced case has gone through a stage when it could have been cured. Adequate surveys are therefore the primary need. Men and women must be trained in the care of lepers, and homes and dispensaries must be opened in addition to existing leper settlements.

A model of the Itu colony is shown; and some idea is given of life in modern leprosy settlements. Newcomers to these centres have often been cast out by their tribes; but they quickly learn that they are offered fellowship and a village life as normal as can be arranged, as well as treatment. Infectious cases are segregated in a village which they have built for themselves, while non-infectious cases come and go from quarters outside. Both types of case are treated in a clinic outside the compound. Children are particularly susceptible to the disease, and those under treatment besides being well fed are educated by qualified teachers who have also acquired leprosy. Some children do well enough to take the school-leaving certificate, and many are successfully cured. Children born of infected women are reared in a special nursery with healthy women to look after them. So long as precautions against infection are taken, their mothers are able to suckle them, for breast-milk does not contain lepra bacilli. If the mother is cured her child is restored to her; if not he is brought up by a healthy foster parent, if possible one of the mother's family.

Photographs show strikingly the improvement and cure of leprosy, as well as the ravages of the untreated disease. Thanks to great donations in the past and to current subscriptions BELRA has a large income, but not large enough; with £350,000 a year the association reckons it could stamp out leprosy in the Empire in one generation. The exhibition inaugurates the Silver Jubilee appeal. Those who wish, and are able, can pay £5 a year towards the care and cure of a leprous child. This sum ensures that he will be admitted to a settlement and given all necessary treatment until he reaches the age of 16, when he will be able to earn his living, either inside or outside the settlement. But subscriptions of any dimensions will help the association to carry out our formidable duty.

1. 167, Victoria Street, London, S.W.1.

DENTAL CARIES

FOR many years Miller's theory attributing dental caries to the effect of carbohydrate fermentation and lactic acid has been fairly widely accepted; but some of the facts now coming to light do not accord with this hypothesis. Thus Pincus and others in this country, and Gottlieb and his associates in the U.S.A., have shown that in the absence of carbohydrates and lactic acid the organic part of the enamel may under certain conditions be dissolved and an appearance similar to early dental caries be obtained.

Atkinson and Matthews[1] have shown by partition chromatography that the amino-acid components of normal dentine are:

Aspartic acid, alpha-alanine, methionine, proline, isoleucine, glutamic acid, threonine, histidine, valine, phenylalamine, serine, hydroxy-proline, lysine, tyrosine, glycine, arginine, leucine, and tryptophane.

In carious dentine the amino-acid components were the same except that the amounts of aspartic and glutamic acids were always reduced, while serine, lysine, arginine, tyrosine, threonine, histidine, and tryptophane were often reduced or absent. Free aspartic and glutamic acids were found in carious, but not in sound, dentine. Atkinson and Matthews claim that aspartic and glutamic acids will attack and decalcify sound enamel and dentine, and they suggest that the carious process is due to liberation by bacteria of an enzyme initiating breakdown of the organic part of the tooth. This breakdown releases aspartic and glutamic acids, which decalcify the enamel and dentine. These workers disagree with the view of Pincus[2] that the enamel and dentine breakdown is due to the liberation of sulphuric acid from chondroitin sulphate, but they agree both with Pincus and with Frisbie and Nuckolls[3] that the organic portion of the enamel is of primary importance in the onset of the disease.

1. Atkinson, H. F., Matthews, E. *Brit. dent. J.* 1949, **86**, 167.
2. Pincus, P. *Nature, Lond.* 1948, **162**, 1014.
3. Frisbie, H. E., Nuckolls, J. *J. dent. Res.* 1947, **26**, 181.

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Miller's theory has held sway for so long that many take it as a matter of course that simple attack by acid on the inorganic portion of the enamel accounts for the onset of caries. Prejudice dies hard; but the fresh approach is beginning to yield interesting results.

TRENDS IN PUBLIC HEALTH

THE revolution in administrative arrangements for our health services has tended to obscure recent changes in attitude towards the meaning of medicine itself. Here too there has been a revolution: in the past five or ten years the whole approach to medicine in this country has altered—at least in theory. Clinical medicine is now seen against the social background of individuals and the family, and at the same time the importance of the medicine of society has been realised. Administrative machinery may come and go without anyone being much the wiser; all administrative arrangements inevitably lose favour in course of time. But this other change is more fundamental.

In a book edited by Dr. Arthur Massey,[1] twenty-three contributors have deftly sketched the new picture. Though a compilation of this kind cannot present a wholly connected line of thought, it shows a common belief in a new application of medical knowledge to the service of the community. The writers do not all agree: thus F. A. E. Crew sees "public health" blossoming out into social medicine, while R. H. Parry expects social medicine to shed its trappings to become public health once more. But such differences of opinion serve to carry conviction for the main theme. Crew and Sir Leonard Parsons make admirable reading about academic disciplines; J. M. Mackintosh inspires us by his approach to housing as a problem of new towns and neighbourhood units; William Edwards gives a convincing account of what the general practitioner can do in preventive medicine; Percy Stocks, G. S. Wilson, Robert Cruickshank, and many others write as experts on their subjects. Publication of such a book is opportune at a time when the fortunes and misfortunes of hospitals get so much of the limelight.

FOOD FOR THOUGHT

ONE of the continuing pleasures of the last year or two has been the gradual increase in range and quantity of the food we eat; and a dietary survey completed a bare twelve months ago might be expected to come like a breath from a past that is best forgotten. Yet there is something to learn, even today, from a study, in the winter of 1947–48, of 298 students under 21 years of age at Edinburgh University.[2]

For a week each student recorded in a log-book what he ate. The results brought to light no real shortage of calories or energy-yielding foodstuffs, while protein and fats were sufficient for health, even though the midday meal was often inadequate. On the other hand, "ten per cent. of all students did not consume an average of three ounces a day of fruits and vegetables (excluding potatoes) together"; and this small consumption was sometimes reflected in an intake of vitamin A and C below physiological standards.

The report observes—perhaps to the surprise of those with memories of Marchmont—that "the majority of landladies looked after their student lodgers well; not a few appeared to give food and services out of all economic proportion to the rent paid." Bad feeding, where it existed, is attributed to ignorance rather than lack of money; "even at University level there is a real need for elementary health education." The report disposes of any lingering idea of a frivolous university life these days; four out of five men students and nine out of ten women took no alcohol in the week. But perhaps the greatest mark of change is that

> "In Edinburgh University today a meal is a physiological action; it is rarely a social occasion. . . . We simply record that food no longer serves as a background for that essential function of a university—the exchange of ideas."

GLIOMAS SIMPLIFIED

Now and again Bailey and Cushing's classification of the gliomas is attacked by would-be simplifiers; but often the suggested modifications merely bypass definite, if inconvenient, histological types and so prove unacceptable. At the Mayo Clinic Kernohan and his colleagues[1] have returned to the charge. Recognising, in common with others, that manifest anaplastic changes in the more highly differentiated, or adult, forms of glioma produce the histological features of spongioblastoma (or glioblastoma) multiforme, they have proposed a system of grading with the elimination of "multiforme" as a distinctive type. They tabulate their scheme as follows:

New	*Old (with new in parentheses)*
Astrocytoma, grades 1–4	Astrocytoma (astrocytoma, grade 1) Astroblastoma (astrocytoma, grade 2) Polar spongioblastoma (obsolete) Glioblastoma multiforme (astrocytoma, grades 3 and 4)
Ependymoma, grades 1–4	Ependymoma (ependymoma, grade 1) Ependymoblastoma (ependymoma, grades 2–4) Neuro-epithelioma (obsolete) Medullo-epithelioma (ependymoma, grade 4)
Oligodendroglioma, grades 1–4	Oligodendroglioma (oligodendroglioma, grade 1) Oligodendroblastoma (oligodendroblastoma, grades 2–4)
Neuro-astrocytoma, grades 1–4	Neurocytoma, Ganglioneuroma, Gangliocytoma, Ganglioglioma (Neuro-astrocytoma, grade 1) Neuroblastoma, Spongioneuroblastoma, Glioneuroblastoma, And others (Neuro-astrocytoma, grades 2–4)
Medulloblastoma	Medulloblastoma

The recognition here of stages of malignancy due to anaplasia is to be commended. But the interpretation of the astroblastoma as such a stage, and the submerging of these tumours in the astrocytoma group, invites challenge. It is questionable, too, whether the polar spongioblastomas can be light-heartedly jettisoned. Their identification has been difficult and there is justification for the view that most of the tumours so labelled have in fact been a variety of astrocytoma, but a well-defined morphological group has recently been recorded by Russell and Cairns,[2] and has been claimed by them to represent the true polar spongioblastomas. As far as the brain is concerned, neuro-epithelioma and medullo-epithelioma can be eliminated, but the well-known tumour of the retina remains to represent the former type. The differentiating forms of medulloblastoma are sometimes demonstrably neuroblastomas, and this fact needs recognition in any acceptable scheme. Another difficulty in classifying the gliomas arises from the blending of well-defined types, such as astrocytoma and oligodendroglioma, in a single mass. This, and the notoriously localised incidence of anaplasia in many of the astrocytomas, should give pause to those who would embark upon a programme of grading in biopsies from this difficult group of tumours.

The next session of the General Medical Council will open on Tuesday, May 24, at 2 P.M., when Sir Herbert Eason, the president, will deliver an address.

1. Modern Trends in Public Health. London: Butterworth. 1949. Pp. 581. 50s.
2. Kitchin, A. H., Passmore, R., Pyke, M., Warnock, G. M. *Brit. J. soc. Med.* 1949, 3, 10.

1. Kernohan, J. W., Mabon, R. F., Svien, H. J., Adson, A. W. *Proc. Mayo Clin.* 1949, 24, 71.
2. Russell, D. S., Cairns, H. *Arch. Histol. normal. pat.* 1947, 3, 423.

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Special Articles

SOME FACTORS AFFECTING THE RESULTS OF TREATMENT OF PERIPHERAL NERVE INJURIES

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A SAMPLE of 82 patients was taken, representative of those patients attending the Royal Free Hospital peripheral nerve unit who had been treated in peripheral nerve injury units during the war. This sample may be regarded as representative of all the patients so treated, for the follow-up by the unit was systematic, and about 90% of those sent for attended. The sample was reduced by 7 by excluding 2 women (women accounted for less than 2% of those attending), 3 patients whose recovery had been delayed by illness other than a nerve injury, and 2 patients in whose cases no reliable surgical assessment could be made. The remainder were interviewed to decide what factors other than surgical ones had influenced the results of treatment. Additional information was obtained by interviewing a further 32 patients, selected from those attending the unit, because they presented special points of interest.

The investigation, an exploratory one, was intended to throw light on two allied problems: (1) the so-called psychological factors affecting recovery from physical illness, and (2) the effects of physical disability on social and occupational adjustment. The patients chosen for examination were regarded as suitable for several reasons; of these may be mentioned especially the recent intensive studies of many of the surgical aspects of treatment of peripheral nerve injury, the excellent facilities afforded by the Medical Research Council's follow-up scheme at the Royal Free Hospital unit, the apparent simplicity of the effects of peripheral nerve injury on the ability to carry on skilled or semi-skilled trades, and the fairly wide range of disability, varying in the sample from a slight clumsiness in manipulation, noticed in cold weather only, to the handicap of a virtually useless limb.

The view was adopted that the objective of treatment of peripheral nerve injuries is to restore the patient's ability to live a life useful to the community and satisfying to himself. These questions were then posed: what degree of success has been achieved, and with what factors is lack of success associated? The success of treatment was judged on two standards—the employment of the patients at the time of the interview, and the occurrence of nervous symptoms. These factors were considered: the degree of disability; the patient's age; the degree to which the limb was exercised during recovery; the incentives to recovery; the secondary gain; and concurrent illness.

METHODS

I questioned each patient on all the points which seemed relevant to the investigation, excluding the details of the injury. The interviews lasted 20–30 minutes. Various ratings were then made (see below). Dr. Bowden made the following three ratings on the surgical features of the cases:

(1) *Relative academic recovery (+3 to −3):* in answer to the question, how does the academic recovery compare with that which would have been expected on purely surgical considerations? By academic recovery was meant recovery judged as regards the muscles observed to contract and the return of sensation, assessed on the results of standard tests.

(2) *Relative functional recovery (+3 to −3):* in answer to the question, how does the functional recovery compare with that which would have been expected on purely surgical considerations? By functional recovery was meant recovery judged from the use which the patient could make of the injured limb.

(3) *Degree of disability (mild or severe):* a judgment of the degree to which the injury was still a handicap to the patient, made without reference to any particular occupation and based mainly upon the academic recovery.

The inquiry was on a small scale. Only patients were interviewed and their statements were not corroborated by relations or employers. Their statements were retrospective and were subject to the usual sources of error. The ratings were no doubt influenced by many factors other than the ones they were intended to assess. In spite of these and other defects in the investigation, however, the findings may have some interest.

WHAT DEGREE OF SUCCESS HAS BEEN ACHIEVED?

The patients' employment was classified arbitrarily according to the following scheme:

S 1.—Employment similar to what he would have been expected to hold had he not been injured.

S 2.—Similar employment, but with some loss of wages or prospects of advancement—e.g., a machinist working on a lighter machine at a lower wage-rate, or a stage manager continuing to work as such but unable to play small parts.

D 1.—Different employment, but of about the same grade—e.g., previously a bricklayer but now a diamond polisher, previously a civil engineer but now an officer in the regular Army, or previously a farm labourer but now a bench fitter.

D 2.—Different employment of somewhat lower grade—e.g., previously an asphalter but now an electrician's mate, previously an upholsterer but now a bus conductor, or previously a farm labourer but now a bread-roundsman's mate.

D 3.—Different employment: now in protected employment or on light work—e.g., previously a builder-joiner but now a carpenter in an Admiralty workshop for the disabled, previously a painter and decorator but now a Government messenger, or previously a farm labourer but now an odd-job man in a factory.

N.—Not fully employed.

The results obtained in the representative sample were:

Class 1.—Employment at the same level as before injury

S 1	26
D 1	14
Total	40 (53%)

Class 2.—Employment at a lower level but satisfactory

S 2	8
D 2	11
Total	19 (25%)

Class 3.—Employment unsatisfactory or not full-time

D 3	10
N	6
Total	16 (21%)

Nervous symptoms were mentioned by 24 patients. In 6 cases the symptoms were either very mild or had been present to a similar degree before injury; in the remaining 18 cases the symptoms were related in some way to the injury. Most of these symptoms were those of anxiety state, such as insomnia, effort intolerance, giddiness, and mental distress; resentment and discouragement were common too. The patients complaining of nervous symptoms were distributed between the employment classes (see above) as follows:

Class 1, 5 patients out of 40 (13%).
Class 2, 5 " " 19 (26%).
Class 3, 8 " " 16 (50%).

Similarly, of the 32 additional patients interviewed 10 mentioned nervous symptoms of a significant kind; and of these, 7 were placed in employment class 3. It is evident from these figures that nervous symptoms and unsatisfactory employment tend to be associated with

* While working as a part-time member of the scientific staff of the Medical Research Council. The investigation was carried out in the summer of 1948, at the Royal Free Hospital peripheral nerve unit at the North Western Hospital, London, in collaboration with D. R. E. M. Bowden.

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TABLE I—EMPLOYMENT CLASS AND DEGREE OF DISABILITY

Employment class	Degree of disability		
	Slight	Severe	Total
S 1	17 (13·5)	8 (11·5)	25
S 2	4 (4·3)	4 (3·7)	8
D 1	9 (7·6)	5 (6·4)	14
D 2	1 (5·9)	10 (5·1)	11
3 (D 3 and N) ..	9 (8·6)	7 (7·4)	16
Total ..	40	34	74*

* The rating was inadvertently omitted in one case.

The number to be expected on a random distribution is given in parentheses. Only in the case of D 2 does the actual distribution between "slight" and "severe" differ significantly from the expected.

one another. Thus they can be considered together as a single practical problem. Probably the patients were both nervous because they were not satisfactorily employed, and not satisfactorily employed because they were nervous, a vicious circle having been initiated. Improvement of the employment was thought to be the more important therapeutic measure, and, in those cases in which more suitable employment was found the nervous symptoms subsided without special treatment.

These results show that, whether judged on the standard of employment or of nervous symptoms, about four-fifths of those treated were restored to a more or less satisfactory life by those measures which are being taken at present. On the other hand, a fifth were not so restored. In considering these proportions it must be borne in mind that conditions during the last few years have made it relatively easy for the disabled to find good jobs; but that full use was not made of the disabled rehabilitation service of the Ministry of Labour.

WITH WHAT FACTORS IS LACK OF SUCCESS ASSOCIATED?

Two points emerge from table I, in which degree of disability and class of employment are related: (1) as would be expected, a relatively large proportion of those with severe disabilities returned to different employment of a somewhat lower, though satisfactory, grade (D 2); and (2) those whose employment was classed as unsatisfactory (D 3 and N) were not characterised especially by severity of disability. Thus, in general, severe disability was not the reason for failure to find satisfactory employment. This conclusion was confirmed by a further device. The 10 patients with the most severe disabilities were picked out from the main sample and the additional cases, and it was found that 8 were satisfactorily employed—a proportion similar to that found when all the cases were combined. Though they may be held to be an oversimplification of the problem, these numerical data show that more is needed than a satisfactory surgical result. Thus several patients were seen in whose cases a good surgical result had been obtained, but who had not overcome the handicap of even a slight residual disability. These and others—admittedly a small proportion of those treated—needed special help to be restored to a useful life.

TABLE II—AGE AND RELATIVE FUNCTIONAL RECOVERY

Relative functional recovery	Birth year				
	Before 1911	1911–15	1916–20	After 1920*	Total
Good (ratings of +1, +2, +3 combined) ..	2	7	11	6	26
Satisfactory (0)..	4	11	10	2	27
Poor (−1, −2, and −3)	4	4	5	9	22
Total ..	10	22	26	17	75

* The youngest was born in 1926.

53% of those born after 1920 showed a poor functional recovery relatively, compared with 22% in the remainder of the sample. This difference in proportion is 2·4 times its standard error and can therefore be taken as reliable.

AGE

The patients were grouped according to their year of birth. As table II shows, relative functional recovery was poor in an undue proportion of those born after 1920, the youngest group. At the same time many of this group made a good recovery.

Similarly, an undue proportion of those born after 1920 did not return to satisfactory employment (table III). Again, many of this group made a good recovery in terms of employment. It will also be noted that the oldest group—those born before 1911—tended to make a better recovery in terms of employment than in terms of functional recovery. The relative academic recovery of those born after 1920 tended to be less good than that of the remainder, but this difference may have arisen by chance, and the data are not presented here.

All the injuries were sustained during the war, most of them in action in 1943 or 1944. The poor results obtained in those born after 1920 are especially striking, because juvenile patients are known usually to make a very good recovery. Thus, excellent functional results were found to have been obtained in the majority of a sample of children examined in a subsidiary investigation. Probably the poor results recorded in this paper were due to the fact that the patients born after 1920 had not, before they joined up, found stable employment to which they could return despite disability. Especially, they had not learnt to accept the responsibilities of independence. Thus, hardly any of those who had returned to their parents were properly employed—mothers being more indulgent than wives and being less inclined to force their disabled men to find a job. Possibly the special circumstances of the immediate post-war years played a part; perhaps injury at about the age of 20 is especially demoralising. At any rate, the data suggest that special attention needs to be paid to the rehabilitation of the young, despite the good surgical results normally achieved.

TABLE III—AGE AND EMPLOYMENT CLASS

Employment class	Birth year				
	Before 1911	1911–15	1916–20	After 1920	Total
1	5	15	14	6	40
2	4	4	8	3	19
3	1	3	4	8	16
Total	10	22	26	17*	75

* 47% of those born after 1920 were in unsatisfactory employment, compared with 14% in the remainder of the sample. This difference in proportion is 2·9 times its standard error and can therefore be taken as reliable.

EXERCISE OF THE INJURED LIMB

In the modern view, active use of an injured limb encourages recovery, whether functional or academic, and the findings in this investigation were entirely compatible with this view. For instance, excellent results were obtained in a housewife, with an injury to the median nerve of the dominant arm, who had not allowed her injury to excuse her in any way from the ordinary work of the house and the care of her young children, and in an art student who was determined that severe injuries in both arms should not prevent him from earning his living by painting. On the other hand, a very poor result was obtained in a company director, with an injury to the ulnar nerve in the non-dominant hand, whose business was done mainly on the telephone, who was not obliged to do anything in the house, and who

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TABLE IV—EXERCISE RATING AND RELATIVE ACADEMIC RECOVERY (ARM INJURIES ONLY)

Relative academic recovery	Exercise rating					
	Plus			Minus		Total
	2	1	0	1	2	
Plus 2 ..	..	1	1	..	..	2
Plus 1 ..	2	3	..	1	..	6
0 ..	7	8	4	2	1	22
Minus 1 ..	2	..	3	1	3	9
Minus 2 ..	..	1	2	..	..	3
Minus 3 ..	..	..	1	..	..	1
Total ..	11	13	11	4	4	43

S=157. T=0·237. P=0·05.

had given up all games, even golf (which he could have played); he made no use of the disabled hand, and the result was a "psychological amputation." The obligation to help in housework, such as washing up, and thus to use an injured arm, had a most favourable influence on the recovery from injuries to median and ulnar nerves especially; to be excused by an indulgent mother or wife had a very bad effect. Similarly, the obligation to use the limb at work was a favourable factor. Paradoxically, they were unfortunate whose well-intentioned employers gave them a light job at an artificial wage, and such a circumstance also made it very difficult to persuade a patient to find employment more conducive to the restoration of the capacity of the disabled limb.

Many of the employment class D3 worked in workshops specially provided for the disabled, where only a poor performance was expected of them. These patients were unhappy, and their relative functional recovery was poor. However well-intentioned and administratively convenient it may be, the policy of providing special workshops for the disabled may have a disastrous influence on their morale and on the restoration of their functional capacity. In most cases it is preferable, from the point of view of the patient's well-being, to treat every man as presenting a unique problem and to make such special arrangements as are necessary to enable him to work in a normal group. When this had been done—e.g., in many of the classes S 2 and D 2—the results tended to be good. Though in some cases their earnings were less than those of their fellows, these patients tended to be content, and they were usually compensated by their pensions. These strictures on special workshops for the disabled apply only within the range of disability found in cases of peripheral nerve injury, and they do not apply to the admirable schemes described by Plewes et al.[1]

1. Plewes, L. W., Barron, J. N., Thompson, A. R., Newell, H. H. *Lancet*, 1948, ii, 699.

TABLE V—EXERCISE RATING AND RELATIVE FUNCTIONAL RECOVERY (ARM INJURIES ONLY)

Relative functional recovery	Exercise ratings					
	Plus			Minus		Total
	2	1	0	1	2	
Plus 3 ..	1	..	..	..	..	1
Plus 2 ..	4	2	..	..	..	6
Plus 1 ..	3	3	2	..	..	8
0 ..	2	8	3	1	..	14
Minus 1 ..	1	..	3	1	..	5
Minus 2 ..	..	..	2	1	4	7
Minus 3 ..	..	..	1	1	..	2
Total ..	11	13	11	4	4	43

S=447. T=0·608. P is less than 0·00001.

The interview data were used to test—albeit imperfectly—the hypothesis that exercise of an injured limb, especially that involving skilled movements, favours both academic and functional recovery. A rating was made, in the case of arm injuries only, of the degree to which an occupation obliged appropriate exercise of the injured limb, and was called the exercise rating. The correlation of this rating with relative academic recovery was just significant statistically (table IV), T being 0·237. The correlation was closer when activities other than occupational ones, such as sports and pastimes, were taken into consideration in making the exercise rating, T then being 0·375. The correlation of the exercise ratings with relative functional recovery were much closer (table V), T being 0·608 and 0·692 respectively. It will be noted in table V especially that the optimum exercise is the maximum, and that there is no level within the range examined beyond which exercise ceases to have value.

A further and similar test of the hypothesis was applied. It could be assumed that in the manual occupations there was a tendency to exercise the dominant arm more than the non-dominant one, and this was confirmed by the data (T being 0·257 and P less than 0·05). Hence it could be predicted that ratings of recovery would tend to be more favourable as regards the dominant than the non-dominant arm. This prediction was borne out in the case of relative functional recovery (table VI), but in the case of relative academic recovery the tendency was not significant, though it was in the right direction. The only reasonable explanation of the former difference is provided by the hypothesis that recovery was better because the tendency to use the limb was stronger.

TABLE VI—RELATIVE FUNCTIONAL RECOVERY AND SIDE

Side	Rating							
	Plus				Minus			Total
	3	2	1	0	1	2	3	
Dominant arm ..	..	4	7	9	2	3	..	25
Non-dominant arm	1	2	1	5	3	4	2	18
Total ..	1	6	8	14	5	7	2	43

The dominant arm tends to make a better functional recovery than the non-dominant one.

S=142. T=0·250. P=0·05.

These findings are compatible with, but do not compel the acceptance of, the hypothesis, since it might be supposed that the tendency to exercise the limb merely showed good recovery for other reasons. However, this alternative explanation is weakened by the fact that the correlation between exercise (of all kinds) and degree of disability was small and insignificant. On the other hand, the relative functional recovery of those whose employment was satisfactory tended to be good, T being 0·330, though the corresponding correlation between relative academic recovery and employment class was insignificant. Altogether the evidence is sufficient to show that functional recovery was favoured by exercise. That academic recovery was similarly favoured remains uncertain.

INCENTIVES TO RECOVERY

Many patients reported that for several months after injury and during treatment they had felt discouraged; that they had felt anxious and uncertain about their prospects of returning to decent employment; that the activities prescribed for them in hospital had seemed aimless, and that they had needed considerable encouragement to persist in them; and that they had regained confidence only slowly after starting work again. Even

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though satisfactory employment had been found, confidence was still impaired at the time of the interview in some cases, especially in those who had suffered a period of unemployment or casual employment before finding suitable work. Some said that a period of waiting to go on a training course had been a most difficult and unhappy period. On the other hand, there were several fortunate patients in whose cases there had been no doubt, even at the beginning of the treatment, what form of employment they would be able to return to. Most of them had decided for themselves what was the objective of treatment, and had been determined to reach it. The best functional results were obtained in those cases in which there had been a definite objective from the very beginning. This seemed to be so because these patients could see a reason for coöperation and persistence in carrying out active exercises and other forms of physical treatment and could assess progress in terms of a standard which had an obvious value to them. No doubt this standard had also a direct effect in the relearning of skills.

Certainly four-fifths of the main sample had found satisfactory employment at the time of the interviews (summer, 1948), but it was astonishing how casual had been the arrangements by which this result had been obtained; a less satisfactory result would have been seen had the interviews been carried out a year earlier; then the employment of 26 patients (about a third of the sample) would have been classed as unsatisfactory. Undoubtedly the result would have been better had vocational guidance been available to these patients at an early stage in their treatment. The patients would have been saved much distress if it had been an explicit objective of treatment not merely to obtain a result pleasing to the surgeon but also to return them to useful employment. It does not appear difficult from the very beginning of treatment of peripheral nerve injuries to predict the degree of residual disability sufficiently accurately for the patient to decide on his future employment, with the advice of his surgeon and of the disablement resettlement officer, preferably that of the area in which the patient lives. If this can be done, so-called occupational therapy loses its artificial character and means exercising the injured limb in movements which form components of the skill by which the patient knows he is subsequently to earn his living. Valuable time is wasted in waiting until the patient is discharged from hospital before it is decided what employment he should seek, and the incentive value of an objective of treatment is then not properly utilised.

NEUROTIC SECONDARY GAIN

Neurotic secondary gain could be held to be a factor delaying recovery only in 1 patient in the main sample and in 2 of the additional patients. The latter 2 were the only ones to whom a diagnosis of hysteria was given, the sensory loss being much greater in both of them than could be explained by the injury. In no patient was the desire to retain a certain pension thought to be a factor affecting recovery to an appreciable degree. Several patients were dissatisfied with their treatment by the pensions authorities, an important factor in their attitude being ignorance of the consideration on which the amount of a pension is decided and of the conditions under which surgical appliances are supplied. The majority shared this ignorance and were uneasy lest any of their activities should lead to an undeserved reduction in their pensions.

CONCURRENT ILLNESS

The relative functional recovery of the peripheral nerve injury was poor in every one of the 5 patients with concurrent illness.

SUMMARY

About half of a sample representative of male patients treated during the war at peripheral nerve injury units were found to have returned to employment at a grade similar to what they would have expected to hold if they had not been injured. The employment of a fifth was found to be unsatisfactory. A fifth complained of nervous symptoms. Unsatisfactory employment and nervous symptoms were associated with one another.

A large proportion of those with a more severe residual disability had changed their employment to one which was satisfactory but of somewhat lower grade; but the residual disability of those not satisfactorily employed was no greater on the whole than that of the remainder of the sample. An undue proportion of the youngest subgroup (those born between 1920 and 1926) was unsatisfactorily employed.

Functional recovery had been favoured by exercise of the injured limb, whether in the course of employment or in sport and pastimes. The evidence for a similar improvement in academic recovery was inconclusive. The functional recovery had been better when an injured arm was on the dominant side than when it was on the non-dominant side.

Recovery had been better when the patient recognised an objective for treatment; the earlier in the treatment the objective had become explicit, the greater had been its value as an incentive. Neurotic secondary gain had been of no practical importance in delaying recovery.

NATIONAL HEALTH SERVICE

Amendment Bill

THE National Health Service (Amendment) Bill, published last week, has two main objectives: (1) to fulfil the promise, by the Minister of Health and the Secretary of State for Scotland, of a statutory guarantee that a whole-time salaried service for general practitioners participating in the service will not be introduced without special legislation[1]; and (2) to give effect, if required, to the recommendations of the legal committee which was set up, under the chairmanship of Mr. Justice Slade, to clarify the effects on medical partnerships of the National Health Service Acts, 1946 and 1947.

This committee's report, which was accepted by the Government,[2] aimed at securing: (1) that the provisions of partnership agreements existing at July 5, 1948, should remain effective as far as possible; and (2) that the compensation clauses of the two Acts should apply equitably to partnerships, and particularly to mixed partnerships (now thought to number only about 50) where some partners have joined the service and others have not.

Among the further provisions in the Bill are the following:

1. That all members of partnerships who have not joined the health service shall have a further right to enter and to receive compensation for the loss of their right to sell the goodwill of their practices.
2. That disputes about remuneration or conditions of service of those employed or engaged in the National Health Service may be referred to arbitration.
3. That executive councils shall have the right to select their own chairmen, who are at present appointed by the Minister or Secretary of State.
4. That the professional member of the tribunal set up to consider whether any doctor, dentist, optician, or pharmacist should be removed from the service, shall be one of a panel of available members, and not a fixed individual. The purpose of this provision is to secure that in each particular case the professional member shall be suitably experienced.

1. See *Lancet*, 1948, i, 615.
2. See *Ibid*, ii, 1029.

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MEDICAL PARTNERSHIPS

Clause 1 clarifies difficulties in interpreting sections of the original Acts which deal with the prohibition on the sale of medical practices and compensation for the loss of the right to sell practices. Among the provisions are: (*a*) there is no prohibition on the sale of practices where required by partnership agreements in force before July 5, 1948; (*b*) where one partner in the service sells the goodwill of his practice to another partner in the service, the compensation payable under the original Acts is substituted for the contract price provided for in the partnership agreement, and becomes payable when the transfer takes place; (*c*) where a partner, not in the service, is obliged to buy the share of a partner in the service (which may be of little value to the former), that obligation is turned into an option, and the partner in the service is no longer entitled to compensation out of the fund of £66,000,000, provided in the original Acts; (*d*) where a partner in the service is obliged to buy the share of a partner outside the service (which the former cannot normally sell again), then he gets compensation from a fund additional to the original £66,000,000 fund.

Clause 2 provides that alterations to partnership agreements do not bar the partners to those agreements at July 5, 1948, from the benefits of this Bill.

Clause 3 gives all members of partnerships who have not joined the service a further right to enter the service (and get compensation for their goodwill) before a second appointed day. The Slade Committee recommended that this right should be given owing to the uncertainty of their legal position at the original appointed day.

Clause 4 brings within the provisions of the Bill transfers of goodwill which have taken place between the appointed day and the passing of the Bill, and provides how the compensation in such cases shall be adjusted.

Clause 5 modifies agreements in force at July 5, 1948, between partners who do not join the service before the second appointed day but where one such partner subsequently joins the service. In such a case any obligation of a partner remaining outside to purchase the share of a partner who enters (which might now be of little value to the former) is converted into an option.

Clause 6 is concerned with medical assistants who have worked for a principal for many years at a low salary in return for an agreement that they shall have the goodwill of the practice on the retirement of the principal. Such an agreement is treated as if it were a partnership agreement, and provisions similar to those in preceding clauses apply.

Clause 7 provides for arbitration in special cases of hardship.

Clause 8 declares that in certain circumstances in which doubt has arisen the original Acts do not prevent a doctor who has never been in the service from selling his goodwill.

OTHER PROVISIONS

Clause 10 provides that a full-time salaried service for general practitioners is not to be introduced by regulation.

Clause 11 makes the same provision for specialists.

Clause 12 extends the scope of the Conciliation Act, 1896, and the Industrial Courts Acts, 1919, to cover disputes about the remuneration or conditions of service of persons engaged in the National Health Service.

Clause 13 enables an executive council to remove from the lists for their area doctors, dentists, pharmacists, and opticians who are not, in fact, providing any service in that area. (This is merely a tidying-up provision and has nothing to do with the machinery for dealing with those who are not providing efficient service.)

Clause 14 provides for minor amendments to the constitution of the tribunal which sits to decide whether doctors, dentists, pharmacists, and opticians should be removed from executive-council lists. Instead of a standing professional member (according to the case), there will be a panel for each profession from whom the member will be chosen for the particular case.

Clause 15 removes doubts about the delegation to professional committees of power to approve the experience of medical practitioners and opticians who wish to take part in the service.

Clause 16 enables district-nursing associations whose constitution forbids it, to dispose of their property to local health authorities.

*Clause 17** requires local health authorities, in certain cases, to pay the fees of medical practitioners who examine patients suffering from mental illness or defectiveness with a view to their admission to a hospital or institution.

*Clause 18** validates certain orders made by the Board of Control for the continued detention of mental defectives.

Clause 19 gives power to require a patient in a hospital, who goes out to paid work as part of his treatment, to contribute towards the cost of his maintenance in hospital. (This applies prinicipally to patients in mental institutions.)

Clause 20 provides: (*a*) (in conjunction with the schedule) that executive councils may, when future vacancies occur, elect their own chairmen, who are at present appointed by the Minister or the Secretary of State; (*b*) that a doctor may claim his fees for answering emergency calls by midwives within three months instead of two; and (*c*) for repeal of a section of the Cancer Act which empowers the Minister to lend money to the National Radium Trust, which is now defunct.

The schedule contains a number of minor amendments of the original Acts. In particular, the claiming of expenses, &c., by members of executive councils and of hospital bodies is brought into line with the rules applied to local-authority members by the Local Government Act, 1948.

POSTGRADUATE EDUCATION IN LONDON

A JOINT board has been established by the Royal College of Physicians, the Royal College of Surgeons, the Royal College of Obstetricians and Gynæcologists, and the British Postgraduate Medical Federation (University of London), under the chairmanship of Sir John Anderson, F.R.S., in order to effect coöperation in providing postgraduate education in the medical and dental specialties. The reference to the joint board is "to consider the existing provisions for the postgraduate education and training of specialists, and invite the attention of medical schools and institutes, hospital authorities, and other bodies providing postgraduate medical education, to such modifications as may from time to time appear desirable."

Since its establishment the joint board has paid particular attention to the procedure for advising postgraduate students on suitable hospital appointments and programmes of study. For this purpose, the services of the staff of the central office of the federation are available, and each Royal college has arranged to provide expert advice and guidance to suitable candidates for its higher qualifications and to other graduates visiting this country for further study. In addition, a small central advisory committee has been formed to assist the central office of the federation in dealing with other postgraduates and to consider problems of common interest in relation to advice and guidance to potential specialists. The board is concerned especially to establish coöperation with medical schools, boards of governors of teaching hospitals, regional boards, and hospital management committees in order that potential specialists may obtain hospital appointments suitable for their training; and it hopes that the new arrangements may prove valuable not only to graduates of the United Kingdom but also to those from universities overseas.

The following representatives have been appointed to the board:

Royal College of Physicians, Lord Moran and Dr. H. E. A. Boldero; Royal College of Surgeons, Lord Webb-Johnson and Mr. Julian Taylor; Royal College of Obstetricians and Gynæcologists, Sir William Gilliatt and Mr. G. F. Gibberd; British Postgraduate Medical Federation, Sir Francis Fraser and Mr. J. B. Hunter.

* Not applicable to Scotland.

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Disabilities

30. PERNICIOUS ANÆMIA

My name is Ted, and in 1928 I applied for a job on the railway as a maintenance joiner, this being my trade. My age then was 27, and after a medical examination—I was passed A.1—I began work in the engineer's department. Sometimes, with bridge repairs and so on, it was hard going, but I was in good health and never bothered about the weather.

The war came, and by 1940 everyone was working at top speed. We were at it ten hours a day for seven days a week; I was also assigned as captain of the rescue party and secretary of the fire-watching party, and was carrying on with trade-union business. After three years of this I began to feel a bit tired, so I went to my doctor, who gave me a fortnight's convalescence. Again the next year, 1944, I began to feel the strain, so I applied for a transfer to the motive-power department. Still I felt more and more tired; and that year I spent my fortnight's leave at home.

Returning to work, I ran into real trouble, with pain in the head coming on about noon each day, and backache somewhere round the kidneys, which made it hard to sit still with any comfort. I tried all kinds of remedies and did get a little relief for short periods from aspirin and backache pills; in fact I took so many that all my joints seemed to be on ball-bearings, and if anyone had shaken me I should probably have rattled like a money-box. My doctor told me that overwork was the cause of the trouble; and when I had heard this from him two or three times I stopped going to the surgery.

Then, in 1946, I began to lose my temper very quickly; and I felt that I did not want anyone to bother me at all. If I had not been a good servant in the past and had not had a good supervisor, I think my services would have been no longer required.

So we come to 1947. One day I sat down to do some thinking, and I thought to myself, "Now, Ted, you'll have to shake this thing off"; but it was easier said than done. Each day I cycled six miles to work; and this was a strain. I was very bad-tempered, and if approached by any of my mates I would be very sarcastic; and I was always in trouble with someone. My wife must have the patience of Job. All I wanted to do was sleep, and the more I slept the more sleep I wanted. I still carried on, hoping to improve, but I did not. At the beginning of 1948 I could not ride my bicycle up any kind of incline: I seemed to be short of breath and my heart would beat like a steam-hammer working overtime. Though I never went off food, I was much troubled with wind after eating; potatoes seemed the main enemy and I learned to give them a miss. About this time, too, I began to find on waking in the morning that in the night saliva had dribbled from my mouth on to the pillow. But the worst trouble was that I didn't feel like working, and nothing seemed to go right. I would start a job, but something always went wrong; then I would throw it aside in disgust and sit down; being alone in the workshop I was fast asleep in a minute or two, and woke up only when an engine came past.

About this time my mates began to tell me I looked as yellow as a Chinaman; so in May I took a holiday in Holland. The first day after I got back I set out for work, but had to stop. I just felt like entering into the gates of heaven; so I returned home the best way I could think of. The next day I went to hospital, anxious to know what was going to happen. The doctor asked me how I felt, and I replied "fed up." He examined me from top to toe and then told me I was suffering from pernicious anæmia. This was the first shock; the second came when he told me I should have to stay a month in hospital. Having never been in hospital before, my one thought was to get home.

The rest is quickly told. A week after injections were started I began to feel better; and two weeks' convalescence at the seaside got rid of the rest of the weakness. Now, with regular injections, I feel as good as ever I did. In fact, I haven't really got what you would call a disability. The only thing is that if I'm a bit late with an injection I somehow feel the need of it; so I try to keep on time.

Medicine and the Law

Legacies to Medical Schools

Leila Holden left the residue of her estate to St. Thomas's Hospital Medical School for certain research and other purposes to be known as the Mildred Holden Research Fund. She died on Jan. 13, 1948, and the estate could not be wound up before the coming into force of the National Health Service Act on July 5.

The question was raised by the trustees—was St. Thomas's Hospital Medical School the same body after July 5 as it was before that date? The legal opinion given to the trustees was that the school could not in fact be the same body after the appointed day as before the appointed day. The reason given was that it was mentioned in the Act and the provision made therein (section 15) that "if any general medical school of the University of London . . . is not incorporated at the passing of this Act, the governing body of the school shall, within a period of six months from the passing of this Act, prepare and submit to the governing body of the said university a scheme, to take effect on the appointed day, for constituting a new governing body of the school."

As a result the matter was brought up for judgment in the High Court of Justice, Chancery Division, and in his judgment Mr. Justice Vaisey held that he could treat the new incorporated body, brought into existence by the combined effect of section 15 of the Act and the Scheme, as identical with the pre-existing medical school and as qualified and indeed bound to accept the benefaction which the testatrix had by her will conferred upon its predecessor the St. Thomas's Hospital Medical School. He went on to say that he could merely direct that the endowment be transferred to the new body or he could say that the new body is entitled to it quite apart from the Scheme. He had been asked to say that the medical school was entitled to the endowment under the combined effect of the Act, the lady's will, and the Scheme, and he was quite prepared so to declare.

It appears from this decision that where a query is raised on similar grounds the medical school should benefit, and for this reason this decision in the Chancery Division may be of interest to other London medical schools. It might also draw the attention of the charitably minded, who would not since the passing of the Act give monies to hospitals, to the fact that the schools are suitable objects for their gifts and enjoy a large amount of freedom and autonomy within the University of London.

ANOTHER HOSPITAL LEGACY

A further case, arising out of slightly different facts, was dealt with by Mr. Justice Harman on May 11. On June 18, 1948, Mrs. Kellner made a will leaving one-eighth of her residuary estate to the Cancer Research Institute and one-eighth to the Royal Cancer Hospital. She died five days later. The "appointed day" on which the National Health Service Act handed over the country's hospitals to the Minister of Health was July 5; the will was not proved, nor had her executors completed the administration of her estate, till after this statutory transfer.

The institute was controlled by the hospital, which was a "teaching hospital" within the Act. Was the institute's legacy vested in the hospital or in the Minister of Health? Should the executors apply the two legacies, or either of them, to the board of hospital governors under section 50 of the Act, or to the Minister, or were they undisposed of?

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The learned judge observed that the institute and the hospital were well-known charities. At the date of Mrs. Kellner's death the destination of the legacies was clear enough. What was the effect of the Act? He had read it section by section but found no guidance as to the fate of legacies to hospitals. The Legislature seemed to have so framed the statute as to leave charitable legacies of this nature outside it. He rejected a suggestion that this problem was a matter which the Act remitted to arbitration; such arbitrations were to be on points of fact, not of law. He held that the interest was an equitable interest held for the purposes of a voluntary hospital in trust property in which there were other equitable interests. It was therefore outside the category of "endowments" and could not be brought within section 7 (10) of the Act. The Minister claimed the legacies under section 6; this did not apply; the interest in an unadministered residue was not a right acquired for the purpose of carrying on the business of the hospital. Section 60 was inappropriate to cover the case.

At the date of Mrs. Kellner's death there existed a charity identifiable as the object of her bounty and capable of taking her bequest. Section 78 (1) (*c*) of the Act had terminated the charity, but the termination was not a lapse; there was no lapse when a legatee survived a testator. Mrs. Kellner's next of kin had no rights. The bequest must be dealt with by a scheme to be brought into court by the Attorney-General in the usual way. The costs of the litigation must come out of the two-eighths of the residue.

The learned judge allowed himself some acid comments on the handiwork of the Legislature. The Act was "almost a miracle of ineptitude." He had studied it with "a bewilderment which finally ripened into despair." While the same criticism might be made of much of the rushed law-making of recent sessions, it may be that the Court of Appeal or an amending Act will simplify these problems.

Public Health

Smallpox

THE unvaccinated woman admitted to the Liskeard Smallpox Hospital, Cornwall, on May 7, developed a semi-confluent rash and is severely ill. In addition, 3 close contacts, all unvaccinated until five days after first contact, agreed to precautionary isolation in this hospital, from which it was reported on May 16 that all were sickening; in 2 smallpox is expected to develop, while in the third vaccination after contact may have influenced the course and resulted in a sine-eruption infection.

A suspected case was admitted to the Ashey Smallpox Hospital, near Ryde, Isle of Wight, on the evening of May 14, on the third day of a severe illness, showing a confluent macular rash with the characteristic distribution of smallpox except for a striking "butterfly" rash on the face. There was early vesiculation of some of the macules. On the fourth day there was extensive pustulation and a diagnosis of acute disseminated lupus erythematosus was made. A negative complement-fixation test for variola-vaccinia was reported from the Central Public Health Laboratory on May 16. Confirmation of this negative result by egg-culture is awaited.

Several suspected cases have been seen by smallpox consultants, but the only confirmed focus of infection is at Liskeard. The circumstances here are in no way disturbing, but there is still a remote possibility of further cases, and vigilance is necessary throughout the country.

Typhoid Fever in Berkshire

Further cases of typhoid associated with the Crowthorne, Berkshire, outbreak have been found at Ottershaw and Didcot, and the total of confirmed cases is now 39; of these, 2 may prove to be secondary infections. The aliment suspected of causing the infection was on sale in the village on April 15, 16, and 19, and was all consumed in that period. The outbreak was self-limiting; the source is still under investigation.

A controlled trial of 'Chloromycetin' is in progress (see p. 869). Seven patients in hospital at Maidenhead have received "therapeutic anti-typhoid (Vi+O) serum" (Felix) which appears to have influenced the disease in its third week.

Parliament

National Insurance Benefits

IN the House of Lords on May 10 Lord HAWKE asked the Government whether they would use the propaganda machine at their disposal to point out to contributors to the National Insurance scheme how small a part of the whole was the medical proportion of their weekly contribution, and that it was not necessary to receive extensive medical benefits to make certain of obtaining a fair return for the contribution. Lord MACDONALD of GWAENYSGOR replied: The position has been kept well in mind by the Minister of Health, who has repeatedly emphasised it by statements in Parliament and elsewhere. It has also been emphasised in Press advertisements, leaflets, and other publicity material in communications to the newspapers. This policy will be continued as opportunity offers. The National Health Service is not an insurance scheme. Nearly the whole cost of this service is borne by general taxation, leaving but a small fraction to come from the National Insurance Fund. Of an insured man's contribution of 4*s*. 11*d*. per week, only 8½*d*. goes towards the cost of the health service, and 4*s*. 2½*d*. is to cover him for cash benefits, retirement, widows' pension, unemployment benefit, and so on. Even if no use whatever is made of the health service, the value of the pension and other cash benefits provided under the scheme is, in fact, for every class of contributor a good return for the contribution paid. The great majority of the workers of the nation were insured before the recent scheme came into force, and they are carrying on the practice which they carried on under the old scheme. There are, however, those who were not insured under the old scheme, who think they ought to make an effort to get something in return for their payments. It may well be that that section of the population needs a little more enlightenment.

Medresco Aids

Lord SHEPHERD, replying to the Duke of MONTROSE, made the following statement: Deliveries of the mark-I 'Medresco' aid are now completed, and a new and improved model, the mark II, is just coming into production. An order for 100,000 of these has been placed with the General Post Office and delivery from the contractor is about to begin, at an anticipated rate of 9000 per month—approximately twice the rate of production of the mark I. Up to the present, about 7000 mark-I aids have either been found to be unsatisfactory or require repair because of damage after issue. These will be repaired and have certain of their components replaced by improved parts, as incorporated in the mark II, and will then be supplied to patients. The reconstruction of these aids and further repairs as they become necessary will begin during the next month.

Meanwhile, research is proceeding on a further improved aid, the mark III, which will be brought into production as soon as possible, and on a bone-conduction receiver for the very small minority of patients not suited by the present air-conduction instrument. The supply and servicing of hearing-aids other than the medresco is a matter for the industry and not one with which the Government is immediately concerned.

There are at present in operation 120 clinics in England and Wales at which defects of hearing can be diagnosed and patients tested for a medresco aid. The aids are being distributed from 25 centres, the trained staff at nearly all of which is being, or is about to be, doubled in order to handle the increased supply of aids. Within about two months the Minister of Health hopes to be able to arrange for an additional 10 distribution centres to be opened, to which part of the waiting-lists at the existing centres will, where convenient, be transferred. When some of the waiting-lists have been cleared, it will be possible for the trained staff of the distribution centres to travel around the diagnostic clinics they serve, and carry out distribution of aids to patients from there. Since the inception of the National Health Service, nearly 20,000 patients have been supplied with medresco aids.

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National Health Service Amendment Bill

In the House of Commons on May 11 Mr. ANEURIN BEVAN, Minister of Health, supported by Mr. ARTHUR WOODBURN, Secretary of State for Scotland, introduced this Bill, which was read a first time. It is summarised in this issue on p. 880.

QUESTION TIME

Regional Hospital Board Estimates

Mr. G. M. SHARP asked the Minister of Health what estimates for the current year had been submitted to him by each regional hospital board, showing separately expenditure on current and capital account; what cuts in each had been proposed by his department; what estimates had been submitted by each board as to the number of beds which would be closed and the number not brought into use by the carrying out of such proposals; and what indication there was that some boards were more economical than others.—Mr. BEVAN replied: Regional hospital boards are at present reviewing their estimates subject to a general directive that the welfare of the patients must not be affected. but detailed reports as to the effect of the revisions proposed by my department have not yet been made by all boards. The extent to which the proposed revisions should be implemented is under review in the light of the information so far received. In reply to the last part of the question, the data are not yet sufficient for the comparison of one regional board with another; experience of at least one year's full working is essential before such comparisons can be made.

Invalid Rations

Mr. T. E. DRIBERG asked the Minister of Food how soon he expected to be able to announce the results of the recent consideration by the food rationing (special diets) advisory committee of the Medical Research Council of the present meat ration and the needs of diabetics and other invalids. —Dr. EDITH SUMMERSKILL replied: The committee have reviewed the present meat ration in relation to the needs of invalids, and they have recommended that no extra meat rations additional to those already allowed need be granted for diabetics or for invalids suffering from spontaneous hypoglycæmia. They are satisfied that the protein available in the present allowances of meat and cheese are quite adequate to construct any kind of diabetic diet. The committee have also recommended that one further extra ration of meat should be allowed in cases of nephritis with gross œdema and gross albuminuria, for both types of hepatitis, and in cases of steatorrhœa.

Hospital Treatment of Tuberculosis

Mr. A. M. SKEFFINGTON asked the Minister of Health the number of tuberculosis patients awaiting hospital treatment in England and Wales.—Mr. BEVAN replied: On the latest information the number is about 9000. Mr. SKEFFINGTON: Is the Minister aware that there are many patients who are kept waiting for long periods through no fault of his, and could he take any steps to expedite the matter?—Mr. BEVAN: I have asked the Tuberculosis Standing Advisory Committee of the Central Health Services Council to make an inquiry into this matter. The House will appreciate that the increase in the number of tuberculosis patients awaiting treatment is due to the better diagnostic facilities and mass radiography, but it is desirable to get them into tuberculosis institutions as early as possible. The reason for delay is ack of staff.

Hospital Staffs

Sir HUGH LUCAS-TOOTH asked the Minister how many hospital boards or management committees required an undertaking from persons seeking to join their medical, nursing, or administrative staffs that they were not or had not been associated with either the Fascist or Communist parties; to what extent such action had been taken on his instructions or with his approval; and whether he would make a statement on the matter.—Mr. BEVAN replied: I have no information that this undertaking is being asked for. If it is, it is neither on my instructions nor with my approval.

Notification of Leprosy

Mr. T. F. HUBBARD asked the Minister how many adults and how many children in this country were known cases of leprosy, what was the number of persons being treated in hospital for active and infectious leprosy; how many such hospitals there were in this country; the number of beds available; and if he would take steps to make leprosy a certifiable disease in this country.—Mr. BEVAN replied: I am considering steps for making leprosy notifiable. As it is not so at present, reliable information about the number of cases is not available. There is one leper hospital, run by a voluntary body, which can accommodate 13 cases, and has 12 there now. Arrangements are being made to supplement this by another provided as part of the National Health Service.

Salaries of Public Dental Officers

Mr. JOHN BAIRD asked the Minister, in view of the fact that negotiations between the public dental officers and the local authorities had now reached deadlock, what steps he was taking to stop the drift of dentists from the public service and to implement the Health Act as regards the priority classes.—Mr. BEVAN replied: This is primarily a matter for the local health authorities upon whom rests the duty of providing dental care for expectant and nursing mothers and young children. The associations of local authorities concerned have not yet entered upon negotiations on the pay claim made on behalf of the public dental officers, but I am pleased to note that some health authorities are making interim adjustments of salary scales pending the negotiations. Mr. BAIRD: If these negotiations break down, will the Minister stand by and let the whole of the dental service for priority classes break down also, or will he step in if no agreement can be reached?—Mr. BEVAN: I am ready to help the progress of negotiations by forming a dental Whitley Council, but I can do this only if both the dental organisations and the local authorities agree. I understand that the dental organisations, who previously refused to join such a council, are now prepared to come in, subject to certain reservations. The local-authority associations have not yet agreed to come in. Discussions with them are in progress.

Mr. SOMERVILLE HASTINGS: Has the Minister considered offering his good offices to settle this unfortunate dispute? —Mr. BEVAN: My hon. friend can assume that I am not standing idly by seeing matters drifting.

Medical Examination of Juvenile Workers

Mr. PETER THORNEYCROFT asked the Minister whether he was aware that firms had to pay for the compulsory medical examination of their juvenile labour; and why medical examination of this kind was not provided under the National Health Service scheme.—Mr. BEVAN replied: These examinations are required by the Factories Acts and employers are not relieved of these obligations by the National Health Service Act. Mr. THORNEYCROFT: While appreciating the necessity and propriety of these investigations, is the Minister aware that a factory which employs its own doctor is not allowed to use that doctor to conduct that examination, and that the firm have to pay substantial premiums under the National Health Service for which they get no benefit for examining their employees? That is a great injustice.—Mr. BEVAN: There are a number of Acts under which employers are compelled to have their employees examined and for which they have to pay for certification. This, of course, is included under the National Health Act, and until the Act is amended the powers will be required. Mr. THORNEYCROFT: Would the Minister have a look at this again, because it all adds to the cost of the eventual product, and will he see if it is possible for employers to use their own doctors in cases where they have them?—Mr. BEVAN: That would require legislation.

Peckham Health Centre

Mr. PHILIP PIRATIN asked the Minister whether he had considered making a grant to the Peckham Health Centre and if he would make a statement.—Mr. BEVAN replied: I am awaiting information from the centre to enable me to consider whether a grant can be made under section 16 of the National Health Service Act.

Soldiers' Records

Lieut.-Colonel MARCUS LIPTON asked the Secretary of State for War why the legal advisers of an ex-soldier were denied a copy of his medical history sheet.—Mr. EMANUEL SHINWELL: A soldier's medical history sheet is maintained for strictly Service purposes, and copies are not furnished to individuals or their legal advisers. The disclosure of medical history sheets would be detrimental to the public interest, as tending to deter Service personnel from seeking medical treatment, and to impair the frankness of Service medical officers in reporting on them. It is the invariable practice to plead privilege for Service medical documents, a fact which is, I think, widely known.

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In England Now

A Running Commentary by Peripatetic Correspondents

IT was a fateful moment when our casualty officer heard that the R.M.O. had some free tickets for Ralph Slater's hypnotism show. Business had been brisk in casualty, and he was ready to stoop to any stratagem, however unorthodox, to cut down the numbers. Visions of long lines of patients streaming from the hospital deeply hypnotised, arms outstretched, and mumbling to each other (under his powerful influence) "We must never go to the 'orspital again" must have stirred him from his customary somnolence beneath the billiards table in the mess.

He returned after the performance with a glint in his eye like that sometimes seen in the expectant hen. Nothing emerged for three days; then, late one evening, while the mess brooded gloomily over its habitual sausage toad, came a cryptic call to casualty. In a quiet side room lay the patient, a young girl with hysterical aphonia and amnesia, quite unconscious. By her side our hero stood triumphant and a little bewildered, not knowing what to do next with the strange power he had recently acquired, and feeling a little sleepy himself. However, the drama of the situation came to his aid, and he announced portentously, "When I count to twelve you will wake up and speak, and your memory will be restored." By now the R.M.O. was on the scene, the coffee still wet on his lips, and the House was present in some force, together with half the night staff and the casualty porter. "Twelve!" rang out but no-one stirred, least of all the patient. This caused some concern for a moment, but after a violent shaking she returned to consciousness and demonstrated in no uncertain manner the efficacy of the treatment prescribed.

Curiously enough, the least impressed by all this has been the casualty officer himself, who complains that none of the nurses can now be induced to approach within a mile of him.

* * *

The first post-bellum Congress of Internal Medicine, at Wiesbaden, was an imposing affair—2500 delegates or at least as many of them as could pack themselves into the Stadt-theater. Our Continental confrères are enthusiastic lecturers and enthusiastic lecturees, with almost non-stop performances from 8.30 to 18.00 and many of them on their feet all the time. Paper followed paper without opportunity for discussion. At first the speakers kept to a set time-table, but ruthless disregard for the chairman's bell soon led to physical intervention to give everybody a chance of saying at least a few words. Greatly daring I presented my little contribution, first in German and then, as a precaution, in English. I am quite certain that 98% understood the English. It is possible that 2% understood the German.

* * *

In England one expects to obtain a secretary, a domestic, or even a locum, through an agency, but not a professor of medicine or a dean for a new medical school. I was amazed to find on a visit to the States that it is quite common over there for such positions, and medical jobs generally, to be filled through agencies. Here is a sample from the bag of Virginia X, who runs an agency in New York: "Wanted, Professor of Medicine for well-endowed Mid-West university. Well-equipped clinics and laboratories for clinical and applied medical research. Opportunity for young physician with the necessary background. Salary $20,000." There is a lot to be said for merely consulting Virginia instead of reading *The Lancet* backwards, and I suppose an agency also serves a useful purpose in sorting out the hopelessly unsuitable.

Most of these agencies for some reason or other are run by women. The director of one of them advertises her services in an American medical journal with a very charming photograph of herself and the statement that her agency has been running for over half a century. Presumably it has not been under her direction all the time, though a mature American doctor that I met averred that he has seen the same photograph for more years than he cares to remember.

* * *

I was recently at an important meeting at which the difficulty of obtaining admission for acute cases to hospital was being discussed. The greater part of our time was occupied in trying to devise some scheme for bringing some sort of compulsion to bear on hospitals.

Surely it should be clear that the hospital is a thoroughfare and not a cul-de-sac with elastic sides, and that at least as much attention should be given to the discharge of patients as to their admission. If there were no difficulty in arranging for the proper care of patients ready to be discharged, there would be little if any difficulty in arranging for admissions.

* * *

Now the sweets have come off the ration I am glad to see that the general public have found another place to queue besides outside my surgery.

* * *

THE E.E. INDEX

JOSEPH SOAK
M.R.C.S.
REGISTRAR IN THE DEPARTMENT OF VERY VITAL STATISTICS, ST. PANDEMONICA'S HOSPITAL

IT used to be generally accepted that, with a few brilliant or indifferent exceptions, the earning capacity of a doctor varied directly with the length of time that he had been qualified, at least up to the age of 50. In the post-war period it has been observed that this general rule has been modified by other factors.

To discover these factors we have made a survey of the 50 members of the medical staff of a large general hospital, calculating the ratio of their emoluments (in £s per annum) to the time qualified (in years). The result we have called the emoluments-experience index (E.E. Index). Our observations are set out in the following tables.

TABLE I—E.E. INDEX OF STAFF GROUPED ACCORDING TO AGE

Age	*E.E. Index*
Under 30	133·8
30–40	91·3
Over 40	77·9

TABLE II—INDEX OF STAFF GROUPED ACCORDING TO SEX

Sex	*E.E. Index*
Male	93·3
Female	145·2

TABLE III—INDEX OF STAFF GROUPED IN AN UNSCIENTIFIC WAY

	E.E. Index
Ex-Service doctors	79·0
Non-ex-Service doctors	124·0

These figures struck us as so significant that we have analysed the figures for ex-Service and non-ex-Service personnel more closely in table IV.

TABLE IV—INDEX OF EX-SERVICE AND NON-EX-SERVICE DOCTORS GROUPED ACCORDING TO AGE

Age-group	*E.E. Index*	
	Ex-Service	*Non-ex-Service*
Under 30	87·0	160·5
30–40	80·0	123·0
Over 40	69·0	83·0

DISCUSSION

Published work on this subject is difficult to review, being largely confined to sincere but soured letters to editors of medical journals. Forecasts have been made from time to time at very high levels. W. Shakespeare gave an inaccurate forecast of this state of affairs (King Henry V, IV, iii, 64). At the beginning of the late war an assurance for the population as a whole was given that service with the Armed Forces would not be regarded as a handicap in the post-war world (Chamberlain, N., *Hansard*, 1939). Pronouncements by the council of the British Medical Association (*Brit. med. J.* 1939; 1940, 1941, 1942, 1943, 1944, 1945) led the profession to suppose that this assurance would apply to them. At an even higher level general confirmation was given that this assurance would be implemented (Roosevelt, F. D., et al., Potsdam, 1945).

SUMMARY

The E.E. Index of 50 doctors has been calculated.

Comparisons show that the E.E. Index is substantially lower in ex-Service than in non-ex-Service personnel.

My thanks are due to all the members of the staff of St. Pandemonica's Hospital who, consciously or otherwise, coöperated in collecting the data for this investigation. Permission to publish was not obtained from anybody.

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Letters to the Editor

OVERCROWDED SURGERIES

SIR,—I am intrigued by the hair-raising accounts of crowded surgeries, rushed work, and threatening atrophy of clinical acumen among my fellow-practitioners. I should very much like to know more about their practices and the way in which they order their lives.

Fifteen years ago I put up my plate in a carefully chosen under-doctored area, with the express intention of filling my surgeries, stimulating my appetite for work, and sharpening my clinical acumen.

Two things became evident fairly early. One was that busy surgeries, like everything else in medicine, occur in epidemics. I have no explanation for this phenomenon, and I continue to be surprised when two exceptionally heavy surgeries lead to four others equally heavy, instead of to the slack period; this turns up in the end, but never quite when I can reasonably expect it. The other thing was that nothing approaching a crowd was to be expected in surgery until the total of my patients reached some 2000 strong; moreover, the crowd did not interfere seriously with my work and my peace of mind until that total rose above 3000 and approached the 4000 mark. Until last July my patients were about half private and half panel.

Long before the figure assumed threatening proportions, I had engaged an assistant and found that 4000 patients enabled me to keep him reasonably happy and content, even though the old National Health Insurance represented a liability rather than an asset from the employing doctor's point of view. The surgeries were shared, the menace vanished, and I had someone with whom cases could be discussed and academic interest kept alive.

Last July most of my patients were encouraged to join the National Health Service, and, with the exception of 6 rather resistive types, all eventually did join. On the whole, attendance at my surgeries has risen, since patients are docile and coöperative; but so has my income. This puzzled me rather at first, and I took the trouble to examine my books and to study the remunerative nature of my various enterprises. I refer to pre-July conditions.

Confinement fees among private patients were on a sliding scale and varied from 3 guineas to 25 guineas, according to the patients' means and the degree to which the confinement interfered with the rest of the work. Of these, the 3-guinea bills—what with the cost of prams and baby linen, and my tardiness in sending in the bills—showed a tendency to be met to the tune of £1 10*s.*, on account. The higher fees were occasionally met in full; but where the husband had been killed in the war, or the family had lost their home through bombing or was otherwise in difficulties, the sending of the bill became a mere unpleasant formality which had little effect on the exchequer.

Vaccinations were compulsory, and the public vaccinator was entitled to a fee of 7*s.* 6*d.* when vaccination had been successfully performed; but lymph was sometimes less reliable during the war, and mothers have always had a tendency to wipe it away when the doctor wasn't looking, because it takes such an interminable time to dry. One way and another, revaccination was frequently necessary, and three vaccinations sometimes failed to produce any result. The princely sum of 7*s.* 6*d.* was therefore either withheld, or very strenuously earned.

Public Assistance work flourished on a meagre capitation fee, out of which the medical officer had to provide drugs and treatment as well; the average age of the population thus cared for was round about 75, and their independence of medical supervision was nil.

The *panel* brought in 8*s.* 2*d.* per year per patient during most of my difficult years in general practice.

The honorary post of physician to the *local convalescent home* for children was, well, an honour.

General work among private patients should have made good these various shortcomings, but it did so only on paper. The chief reason for this is, I think, that the heart, no less than the mind, has its say in translating such work into earnings. In a reception area, neither the permanent residents nor the evacuees were sufficiently unencumbered to invite carefreeness in matching the fee to the amount of attention given. In any event, Mr. Bevan's impartiality in paying for rich and poor alike has eased the situation tremendously; in encouraging booked confinements regardless of private means, he can afford to leave the heart out of it, and so ensure automatic precedence for the doctor's fee, as against the other necessities such as cot and pram. Above all, he assures an income which, with all its drawbacks, has the advantage of being guaranteed and predictable, so that one can plan the work and the assistance which will be needed for it.

In my case, the guarantee itself has steadied the exchequer considerably. I can see that it may fail to do so where patients are few; but in no way am I able to reconcile overcrowded surgeries with a total of patients insufficient to provide a margin for such assistance as may be necessary to prevent skimped and hurried work. Such may have been the case with the old N.H.I. scheme, and one of its drawbacks was that private patients had to be asked to pay rather generously in order to enable the doctor to carry the burden of the panel. (Whether or not they complied with this request is another matter; in any case, who could blame them?) That capitation fee is doubled today; booked confinements are incomparably more frequent, and the 7-guinea fee is certain, among just those patients who would have paid none or would have had a greatly reduced fee. These effects are most noticeable in overpopulated districts where patients are many and poor—just where surgeries could be expected to be longest and most crowded. How then did these practices manage before the service started, when work among the poorer classes was genuinely underpaid?

I refuse to accept the explanation that conditions in my practice are unique; they were, and they are, exactly what the respective methods of remuneration had made them. The financial improvement through the service can be followed step by step in black on white, and it is the inevitable result of the changes I have indicated. It is equally inevitable that these changes will relieve practices in almost numerical proportion to their size and to the poverty of the patients.

Why then all these endless surgeries? Why so many unwilling slaves among general practitioners, when at last they can afford the help they need? I wish someone would explain.

FAMILY DOCTOR.

CANCER OF THE BREAST

SIR,—In his letter of April 9 Mr. Holman, quoting from the report of the clinical cancer research committee of the British Empire Cancer Campaign,[1] remarked that the figures giving the survival-rate of patients treated by local mastectomy "are vitiated by the grouping under 'local mastectomy' of 83 patients in whom the axillary lymph-nodes were also excised."

The issue raised is so important that the records of these 83 patients have been analysed separately to find out if there were any statistically significant differences between the survival-rates of these patients and of those in whom the axillary nodes were not excised.

Altogether 133 patients were treated by local mastectomy, in 40 of whom the axillary lymph-nodes were also excised; 100 were treated by local mastectomy with postoperative radiotherapy or implantation of radium, in 43 of whom the axillary lymph-nodes were also excised. The respective survival-rates are shown in the following table:

	Mastectomy alone	*Mastectomy with radiotherapy*
A. Axillary lymph-nodes not excised—		
Total no. of patients	93	57
No. of known survivors	38	24
% survived	40·9	42·1
B. Axillary lymph-nodes excised—		
Total no. of patients	40	43
No. of known survivors	14	16
% survived	35·0	37·2
Difference between the percentages of known survivors of groups A and B	5·9 ±9·1	4·9 ±9·8

It will be seen that the differences are not statistically significant.

1. Harnett, W. L. *Brit. J. Cancer*, 1948, **2**, 212.

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Examination of the figures after breaking down into stages showed a survival-rate in stage 1 of 55·1% of 69 cases treated by local mastectomy alone, and 66·6% of 18 cases in which the axillary nodes were excised in addition—a difference of 11·5±12·6. In stage 2 the corresponding survival-rates were 14·3% of 14 cases, and 35·7% of 28 cases—a difference of 21·4±13·0. These differences are not statistically significant.

The same table in the report shows several groups of cases in which various forms of radiotherapy were combined with local excision of the tumour in the breast. None of these groups contain a sufficient number of cases for the figures of the survival-rates to be statistically significant, though they indicate useful lines for future investigations.

British Empire Cancer Campaign,
11, Grosvenor Crescent, London, S.W.1. W. L. HARNETT.

THE LONDON LOCK HOSPITAL

SIR,—I believe that your annotation of May 7 on the undesirability of misappropriating the London Lock Hospital will have been welcomed by most earnest venereologists in this country.

Apart from the fact that the Lock Hospital is well located as an instrument for preventing the spread of venereal diseases by treatment of the infectious, it is particularly well equipped for their management; and, from my long experience in this branch of medicine, I can think of no hospital in London that is more suitable as a centre for postgraduate instruction. Its equipment both for treatment and instruction (the latter including projector and epidiascope) was brought up to date before the appointed day; it has a thoroughly well-appointed laboratory and premises in which research in venereology could be carried out on a large scale; and it is admirably located for the convenience of teachers who would be invited to collaborate in the instructional work.

Administrators with little experience of venereal diseases are apt to think that now we have the help of antibiotics there is no longer any need for postgraduate instruction in venereal diseases. Such a view implies a denial of the need for accurate diagnosis before the application of treatment. I am confident that venereologists everywhere will support me in saying that there never was a time when the evil consequences of such a policy should more than now be thoroughly impressed on the medical profession.

London, S.W.1. L. W. HARRISON.

*** When it met on May 9, the North-West Metropolitan regional hospital board referred for further consideration a proposal that the London Lock Hospital should be taken over by the West End Hospital for Nervous Diseases.—ED. L.

MINISTRY OF PENSIONS APPOINTMENTS

SIR,—A recent issue of THE LANCET carried an advertisement of twenty established vacancies in the Ministry of Pensions and other Government departments. On the Sunday of the same week the Minister of Pensions described in the *News of The World* his efforts to humanise his department and to meet some of the just claims of the war-disabled.

The juxtaposition in time of these two notices is somewhat ironical; for, except for those who have elected to remain outside the National Health Service, almost the only doctors for whom no pension rights are provided are the temporary medical officers employed by Government departments such as the Ministry of Pensions and the Ministry of Health. It would therefore appear to be a matter of simple justice for the Minister of Pensions to see that such temporary medical officers as desire it and are not barred by age, are immediately established and given their pension rights before further vacancies are advertised.

Lest the Minister take refuge in the fact that, theoretically, it is the Civil Service Commissioners who appoint established officers, I can assure him that there have been several establishments in recent years without benefit of commission, so to speak. Moreover the fact that many of these temporary officers have already been with the Ministry for five years or more and have recently been given contracts in order to retain their services for periods up to five years, makes appointment by the commissioners unnecessary and indeed farcical.

In any case, it is surely somewhat ludicrous that any medical officer employed by a Government department should be without pension rights in these days; for he is surely as much part of the National Health Service as a general practitioner or specialist under the National Health Service Act.

UNESTABLISHED SIX YEARS.

SEROLOGICAL EVIDENCE OF Q FEVER

SIR,—Dr. Stoker, in his article of Jan. 29, refers to the outbreaks of Q fever in the Mediterranean area during the late war.

The German troops were severely affected in Greece and Italy in the winter and spring of the years 1941–44, and their physicians recognised the nosological entity of the infection though they failed to isolate the causative agent. The Allies, on the other hand, suffered also from the same condition in Italy, but they confused it with atypical pneumonia.

The causative agent was first isolated in Greece at the Hellenic Pasteur Institute by myself in the spring of 1944. This is mentioned in *The American Journal of Hygiene* (1947, **54**, 2), where it is pointed out that American workers in Italy isolated the causative agent in 1945 after having been informed that I had achieved experimental infection of the guineapig by injection of blood and sputum from patients.

The enigma of the establishment of Q fever in the Mediterranean area in the form of epidemic and seasonal bronchopneumonia was explained by my research in 1947. I showed that goats and sheep must be regarded as the principal source of infection in man and that transmission by respiratory droplets plays only a limited part in the propagation of the disease. In goats and sheep (as in man) Q fever manifests itself as a respiratory disorder, and the virus persists for a long time in their milk.

Institut Pasteur Hellénique, Athens. JOHN CAMINOPETROS.

STREPTOMYCIN IN NON-TUBERCULOUS INFECTIONS

SIR,—I read with interest the article by Dr. Buxton and his colleagues, in your issue of April 30.

As one who has taken an interest in the problem of rhinoscleroma for many years, I studied particularly the report of case 66, in which the local condition improved considerably after two months' treatment with streptomycin. Though convinced that the improvement was due to streptomycin, I noticed that the patient had previously been given penicillin and deep X-ray therapy; and the possibility that these accounted for the local improvement cannot be excluded. Besides pressure therapy (bougies and laminaria in the nasal cavity, Schroetter and Thost bougies in the larynx and trachea) X-ray therapy is helpful in overcoming stenosis of the air-passages.

I think, therefore, that we should look for another criterion in estimating therapeutic improvement. This seems to be afforded by the agglutination reaction, or the specific complement-fixation reaction of the blood-serum with the filtrate of Frisch's bacillus scleromatis, described by Goldzieher and Neuber. Often, despite remarkable improvement after local treatment or X-irradiation, the serological reaction remains positive, as in the analogous case of the healing of a syphilitic gumma whilst the blood Wassermann reaction remains positive.

At a medical meeting at Lwow in 1941, Loewenfisch described his experiments in the treatment of rhinoscleroma. He achieved remarkable local improvement with *negative* serological reaction in patients after autohæmotransfusion with blood previously submitted to X-irradiation.

At the Royal National Ear, Nose, and Throat Hospital in 1947, I showed a case of early rhinoscleroma which had been previously exposed to intensive X-ray treatment.

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To any laryngologist experienced in this disease the diagnosis would be certain, although only slight typical changes were found in the nose, epipharynx, and larynx. Despite careful examination, the biopsy examination of an infiltrated vocal cord, kindly performed by Dr. H. A. Lucas, unfortunately showed no Mikulicz cells or typical plasma-cells; the slides merely showed a chronic inflammatory process of the interstitial tissue.

Discussing the case, I felt that some of my colleagues still remained unconvinced despite a pure culture of bacilli belonging to the Friedländer group. The complement-fixation reaction afterwards was strongly positive and fully justified the diagnosis. (Another biopsy from a nodule in the epipharynx, made 3 months later, showed many plasma-cells in the chronically inflamed tissue.)

I mention this case in order to show how important the serological reaction may prove in cases of diagnostic difficulty. I suggest that this reaction should be tested in all cases of rhinoscleroma before and after treatment with streptomycin; this, in my opinion, would be the best criterion of its antibiotic value.

London, S.W.5. J. BIBER.

EDWARD JENNER

SIR,—May I remind your readers that the original autograph draft of Edward Jenner's Inquiry, which you quoted last week in your excellent bicentenary leading article, is among the most treasured possessions of the library of the Royal College of Surgeons of England?

By permission of the president, Jenner's manuscript is being lent for exhibition at the Royal College of Physicians on the birthday anniversary, and will afterwards be on view at the Wellcome Historical Medical Museum.

Royal College of Surgeons, Lincoln's Inn Fields, London, W.C.2. W. R. LEFANU Librarian.

CARBON TETRACHLORIDE POISONING

SIR,—The following case of delayed carbon tetrachloride poisoning presents some unusual features.

A man, aged 53, accidentally drank about 2 oz. carbon tetrachloride when under the influence of alcohol. He vomited a few minutes later. He arrived home, unaided, 2 hours later, when he again vomited. Vomiting persisted for the next 2 days, and he had crampy abdominal pains. He then made a partial recovery but remained lethargic; 8 days after ingestion of the poison he developed diarrhœa and passed 12 dark stools in the 24 hours. On the 9th day he had slight swelling of the face and hands and a very severe headache.

I first saw him on the 13th day. He was very weak and listless. The diarrhœa had persisted and the stools were black. The blood-pressure was 225/100 mm. Hg. The urine contained granular casts and a moderate amount of albumin.

He was admitted to hospital on the 15th day. His general condition gradually deteriorated; he refused to eat. The loose black stools continued and the perianal skin became excoriated. The blood-urea was 440 mg. per 100 ml. on admission and increased to 550 mg. 4 days later. He had a severe epistaxis on the 18th day. The blood-pressure gradually fell and on the 22nd day was 120/80 mm. Hg.

The fundus oculi was normal. The bleeding and coagulation times were normal; Hb 70%. Jaundice did not develop; the van den Bergh reaction was normal; and there was no diminution in liver dullness. Albuminuria persisted.

On the 23rd day he lapsed into coma and widespread muscular twitchings developed. He died on the 24th day.

At post-mortem examination there was no abnormality in heart or lungs. The mucous membrane of the stomach was greyish-black with patches of erosion. The intestinal mucosa showed irregular patches of congestion. The kidneys were acutely congested. The liver was of normal size and showed slight fatty changes.

Histological examination revealed changes as follows:

Kidneys.—Glomeruli swollen and disintegrating. Epithelial lining of the tubules swollen and desquamating, many tubules containing casts.

Liver.—Centrilobular zonal necrosis. The rest of the liver showed advanced fatty infiltration.

Intestines.—Epithelial lining of the glands had disappeared with hæmorrhage into the gland lumen.

Death occurred 24 days after ingestion of approximately 2 oz. carbon tetrachloride. There was no clinical evidence of hepatic insufficiency. The kidneys suffered most damage, both clinically and pathologically. The ingestion of alcohol immediately before swallowing the poison no doubt increased the absorption and the toxicity, and lowered the resistance of the body tissues.

Wavency Hospital, Ballymena, Northern Ireland. ROBERT J. KERNOHAN Physician.

GRADING OF SPECIALISTS

SIR,—I am instructed by my committee to send you a copy of the following letter which has been sent to the Liverpool Regional Hospital Board:

"My committee wish to draw the attention of the Regional Board to the rising tide of indignation felt widely amongst the Regional Board's specialists at the method and results of the grading of specialists by the Assessment Committees in this region. Furthermore, we wish to draw attention to . . . the use of the grades Senior Hospital Medical Officer and Junior Hospital Medical Officer to describe those performing specialist work. These grades have been applied to many persons holding specialists' appointments in Regional Board hospitals. There are many anomalies in the gradings which have been circulated, and it would appear that in particular insufficient weight has been given to specialist experience in the Armed Forces."

V. COTTON-CORNWALL
Hon. Secretary,
Liverpool Regional Hospitals
Medical Association.

AMPHETAMINE IN DERMATOLOGY

SIR,—Since September, 1947, I have used 'Dexedrine' (*d*-amphetamine sulphate) in the treatment of twenty-two cases of chronic skin disease. The results, though inconclusive, suggest that this therapy may have a place in the treatment of neurodermatitis and skin conditions with a well-marked psychological factor.

There is in any skin clinic a core of chronic cases. These patients become depressed and lose the will to recover, a fact which prolongs their illness despite physical treatment. It occurred to me that this depression might be counteracted with dexedrine, and that, if the skin condition improved during this treatment, improvement might continue after the withdrawal of dexedrine. This conception was strengthened by the successful treatment of chronic itching by continuous narcosis.[1]

Two ward patients were given dexedrine in small dosage, one 5 mg. tablet daily at 10 A.M. One, with seborrhœic dermatitis, had been eleven weeks in hospital and was deeply depressed and making no progress. He was discharged from hospital, after fourteen days on dexedrine, cheerful and clinically improved. This improvement was maintained. The second patient, with infective dermatitis, had been ten weeks in hospital and was making slow progress. He was discharged after fourteen days on dexedrine. His progress since discharge has been uneventful except for a minor relapse.

Stimulated by these results a trial of the treatment of outpatients with chronic skin disease was undertaken. The orthodox treatment was as far as possible left unchanged, dexedrine tablets being given in addition.

The first series were eleven chronic cases taken at random and of varied ætiology. One 5 mg. tablet of dexedrine was given daily at 10 A.M. In only three of the eleven cases was there any improvement—a case of neurodermatitis, a case of generalised pruritus, and a case of pruritus vulvæ.

A second series, comprising six cases of neurodermatitis, one of pompholyx, one of nummular eczema, and one of dermatitis, were then given one tablet daily for a week, followed by one tablet thrice daily for a variable period. As a control three cases of neurodermatitis were put on a similar dosage of inert mock dexedrine tablets. The result was not so dramatic as had been hoped. Of the nine on active tablets six improved (five of neurodermatitis and one of pompholyx), and in five of them improvement was maintained after withdrawal of the dexedrine. Three cases did not respond. Of the three control cases one improved and two did not.

1. MacCormac, H., Sandifer, P. H., Jelliffe, A. M. *Brit. med. J.* 1946, ii, 48.

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One patient had to discontinue dexedrine because he could not sleep, became nervous, and could not concentrate. He was on one tablet daily at 10 A.M. In no other case were any untoward symptoms reported. There was no apparent loss of appetite on this dosage.

One case was of particular interest:

A man, aged 32, with neurodermatitis, had had a patch of lichen simplex chronicus above his right internal malleolus for three years and three months. He had been treated at the clinic for a year and a month, during which time he had shown some improvement but had relapsed and complained of severe pain. He was put on dexedrine one tablet daily for a week and then three tablets daily, with complete relief from pain. When dexedrine was stopped, he again complained of pain. He was put on control tablets for two weeks, with no relief. When he was given dexedrine again, the pain ceased. The lichenified patch is thinner, though its extent is as yet unchanged. Dexedrine therapy was started on Sept. 8, 1948, and finally discontinued on Nov. 17.

The number of cases observed is small and the control inadequate, but the results appear to warrant further, more extensive, and better-controlled trials of this form of therapy in the depressed skin patient. The significant fact is that where improvement was seen it was in cases of neurodermatitis or those with a well-marked psychological factor (generalised pruritus, pruritus vulvæ, pompholyx).

I wish to thank Dr. M. S. Smith for permission to publish the above findings, and Messrs. Menley and James Ltd. for a supply of dexedrine tablets and of inert mock tablets for control.

Victoria Infirmary, Glasgow. R. WORKMAN CARSLAW.

CARDIOSPASM

SIR,—The case described by Dr. Magonet (April 9) suggests atony of the œsophagus rather than cardiospasm. What is called "globus hystericus" is usually atony of the œsophagus.[1] Psychotherapy is of help, as in the case reported by Dr. Magonet.

Mar. Lázně, Czechoslovakia. TH. OLBERT.

SCORPION STINGS

SIR,—The use of the scorpion in the cure of scorpion stings goes back even further than Robert Boyle, who was quoted in the interesting letter by Dr. Martin (May 14). For Celsus in Book v 27, 5 (in the translation by W. G. Spencer, Loeb Classical Library, Heinemann, Vol. II, p. 119) says:

> "For the scorpion itself is the best remedy against itself. Some pound up a scorpion and swallow it in wine; some pound it up in the same way and put it upon the wound; some put it upon a brazier and fumigate the wound with it, putting a cloth all round to prevent the escape of the fumes, afterwards they bandage its ash upon the wound."

Cambridge. ALAN LYELL.

SIR,—Prompted by the correspondence on this subject in your columns, we should like to record a specific treatment which we have been unable to find mentioned in textbooks or journals.

The treatment is simple, and is dramatic in its effect. It consists in the administration subcutaneously of gr. 1 emetine hydrochloride in 1 ml. distilled water. Emetine by mouth is valueless. The injection may be made either directly into the area of the sting or elsewhere on the affected limb, the latter site being equally efficacious although the effect is perhaps slightly more delayed. We have both had considerable experience of the method, which we adopted with a certain scepticism, but which proved so effective that our doubts were rapidly dispelled. The intense pain which is a characteristic feature of scorpion stings is immediately and permanently relieved. We can offer no explanation whatever of the rationale.

The origin of this treatment is obscure. It was traditionally used by the sleeping-sickness medical officers in Nigeria, and we were informed about it by Dr. C. Hollins and Dr. A. J. Duggan, both members of that service. However, neither of these workers, who have both had a much wider experience of the method than we, claims the credit of first observing the effect; and we have been unable to trace its history any further back. Can anyone name the originator of this most effective treatment?

Group Laboratory, Archway Hospital, London, N.19. J. G. A. MCSORLEY.
National Institute for Medical Research, London, N.W.3. W. L. M. PERRY.

ULTRAVIOLET LIGHT FOR DUPUYTREN'S CONTRACTURE

SIR,—Since my return from the sunshine of the East four years ago, I have used an ultraviolet lamp. Consequent on the use of a trowel in my garden, I developed Dupuytren's contracture affecting the little and ring fingers of the right hand. Six months ago I thought I would see whether the rays would do any good to the hand. To my surprise and delight the thickening has greatly subsided and there is no tendency to contraction of the fingers.

Falmouth. F. J. W. PORTER.

TRAINEE SPECIALISTS

SIR,—May I make a very strong plea that the term "trainee" be not allowed to come into general use as applied to us? As you yourself point out in last week's leading article, many registrars, R.S.O.s, and assistants are of fairly high standing and qualifications, and, whatever may obtain in teaching hospitals, in small provincial hospitals it is not unknown for surgeons in these categories to be at least as proficient as the general practitioners forming the visiting staff, who are presumed to supply the training.

But much more important are the disadvantages which such a nomenclature might have in special cases, and I am sure that the Minister of Health would be the first to realise the very undesirable publicity which might result. For example, in very many hospitals the registrars do all the emergency surgery. Even with the best management a death on the table is sometimes bound to occur and lead to a coroner's inquest. Not all coroners are kind, and it is quite possible that the question might be raised as to why such a senior operation was left to a "trainee," by which a lay person might easily understand a surgeon in need of training. Certain sections of the press might easily make use of such an incident in order to discredit our new health service.

It may be childish; but I for one am certain that the hospital patient would prefer to have his gastrectomy done by the surgical registrar or resident surgeon rather than by a "trainee," and his anæsthetic given by the anæsthetics registrar or resident anæsthetist rather than by another "trainee." Do let us keep our traditional and time-honoured designations; they mean much to our patients and to us.

SURGICAL REGISTRAR (Grade I).

THE MEDICAL ILLUSTRATOR

SIR,—The teaching of medical students by the caricature diagram seems to me an insult to their intelligence. University students must learn to understand information given in books, tables, and graphs, for these are the universal methods of presenting scientific material.

Dr. Mac Keith's example, mentioned in his letter last week, that "pertussis has a high mortality under one year and may damage the lungs of toddlers" and the accompanying table are straightforward, and should be readily understood in so many words and the significance appreciated and remembered by any medical student. Headline and poster teaching may be a convenient short cut to teaching more complicated facts and figures, but this method does away with the effort which I believe to be necessary for most of us to get our brains into the habit of reasoning and not just remembering.

Medical training consists in part in learning the scientific method of accurate observation and reasoning. Medicine still needs the scientific method, and university students deserve better than "first-aid" diagrams, however brilliantly executed. Is there any science which can be properly portrayed by caricature?

London, N.2. JEAN LAWRIE.

1. Holznecht and Olbert. *Z. klin. Med.* 1910, 71.

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INDUSTRIAL NURSES

SIR,—In your annotation of May 7, passing reference is made to "other bodies, including the Birmingham Accident Centre" who "train for their own certificate."

As chairman of the joint committee consisting of an equal number of members from the University of Birmingham and the Accident Hospital, may I briefly clarify the position? The industrial nursing course was first organised in 1942 by the university and this hospital. It offers a twelve-month residential course in preparation for the industrial nursing certificate issued by the university. At the present time more than forty nurses take the course each year, but unfortunately, owing to lack of residential accommodation, a still greater number are refused. Recently a refresher course was inaugurated by my committee and held ten days ago: this course was to be the forerunner of many in the future.

Birmingham Accident Hospital. W. GEORGE SPENCER Chairman, Industrial Committee.

MULTIPLE-PRESSURE TECHNIQUE OF VACCINATION

SIR,—I have read with interest your comment last week on the film showing the multiple-pressure technique of vaccination. It is acknowledged that if the vaccination takes, a lesion forms which requires protection. May I prevent possible misunderstanding by pointing out that the dressings employed in the film are not occlusive as that term is usually understood. The dressing has been specially constructed with the following features: (1) a large absorbent pad to give protection for the lesion; (2) three perforations in the outer film covering permitting of ample aeration; (3) attached to the perforations a specially prepared gauze which, while permitting aeration, does not permit water to penetrate. The patient therefore has the necessary protection against outside influence and is able to bath.

A. De St. Dalmas & Co. Ltd., Junior Street, Leicester. H. N. BREAM Chairman and Managing Director.

PSYCHIATRIC BEDS IN A GENERAL WARD

SIR,—Few will dispute the competence of last week's article by Dr. Carson and Dr. Kitching. The presentation is lucid, the comments are shrewd, and the contents satisfying. But what reason can be given for inserting the paragraph which includes these two sentences?:

> "Psychotherapy, except the most superficial, was obviously impracticable with the staff and time available. That is to say, broadly, psychotherapy was necessarily confined to that of kindly interest, reassurance, and the discussion of obvious difficulties."

Psychotherapy is never superficial and is solely related to the investigation and interpretation of material which, so far as the patient is concerned, lies beneath the level of awareness. The type of help outlined in the passage quoted could be provided by any kindly disposed person and involves neither psychological knowledge nor psychotherapeutic equipment.

The young aspirant to a life of psychotherapeutic practice would do well to read the article and to contemplate the relation of this paragraph to the whole. The latter is written about physical treatments in psychiatry and their use in a general ward; the reference to psychology is courteous but irrelevant. With these considerations in mind the aspirant can at least avoid one sort of environment which will waste his energy and frustrate his hopes.

London, W.1. MURDO MACKENZIE.

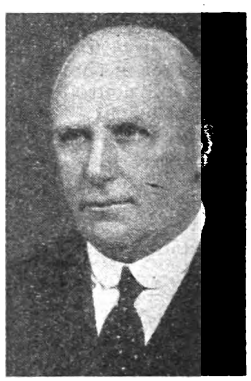
". . . Regardless of where the responsibility rests, the facts are that hordes of people are being given the impression that they need the services of psychiatrists; they are then being advised that the shortage of psychiatrists makes it quite impossible for them to get psychiatric help. They are being warned that one out of twenty or twenty-five persons will wind up in a mental hospital; they are then being presented with the terrifying picture of the horrible conditions in mental hospitals. We have every right to ask if this overall situation is not creating an anxiety that cannot be easily liquidated."—Dr. C. C. BURLINGAME in 125th Annual Report of the Institute of Living, Hartford, U.S.A.

Obituary

FREDERICK NORTON KAY MENZIES

K.B.E., M.D., LL.D. EDIN., F.R.C.P., F.R.C.P.E.

Sir Frederick Menzies, county medical officer of health for London from 1926 to 1939, was a strong and able administrator. When in 1930 some eighty hospitals, with more than 42,000 beds and a staff of nearly 20,000, were transferred to the London County Council, he was faced with the task of welding them into a comprehensive hospital service; and he proved equal to the grave difficulties this involved. By the outbreak of war nine years later, the council, accepting his guidance, had done a great deal to raise the standards of its heterogeneous institutions; and, though ill health then obliged him to retire, his reputation stood higher than ever. During and after the war he contrived to continue valuable work of various kinds, especially for hospitals, and as lately as last March he visited the British Hospital at Port Said, of whose committee he was chairman. On the return voyage he developed pneumonia, from which he never fully recovered; and he died in London on May 14, at the age of 73.



[Press Portrait

The second son of John Menzies, a civil engineer, of Menaibank, Caernarvon, he was educated at Edinburgh University and qualified in 1899. After postgraduate study in Vienna and Berlin, and resident appointments at the Brompton Hospital, Great Ormond Street, and the Western Fever Hospital, he became demonstrator and lecturer in public health at University College. In 1909 he joined the L.C.C. service as a part-time school doctor, and in 1911 he gave his whole time to this work, inaugurating the school medical service in the East End of London. When, under the National Health Insurance Act of 1912, the council took over the care of the tuberculous, his chief, Sir William Hamer, chose him to prepare a scheme which would bring together all the different agencies then dealing with tuberculous patients in London. Later he was asked to work out the details of a similar scheme for the diagnosis and treatment of venereal diseases. When in 1924 he became director of the hospitals and medical services department of the Joint Council of the British Red Cross and the Order of St. John, he continued to act as an adviser on this part of the L.C.C.'s work.

In 1926 he returned to the L.C.C. as county medical officer. He was the third of a distinguished dynasty: Shirley Murphy had been a re-forming sanitarian; William Hamer had been a scientific epidemiologist; Menzies proved himself to be a man of affairs, with great drive and a knack of getting his own way on essentials. When faced with the hospital complexities of London he already had many contacts with the hospital world through the Red Cross, the King's Fund, and as a governor of the London Hospital, and this knowledge of the working of the voluntary hospitals served him well when he had to administer and unify the municipal hospitals of London. This proved an almost superhuman task, for many of the hospitals were so old as to be obsolescent, and few were adequate. The economic crisis of 1931 added to the difficulties. For such work, however, he was well fitted. To a commanding presence and a persuasive tongue he added a facility for choosing the right assistants. Friendships in high places, and private means, helped him to maintain an independence of outlook which was one of his valuable attributes; and he knew just when to press forward with a scheme and when to wait.

Heredity and training made him what he was; with a clear idea of right and wrong, just and firm in judgment, allowing no compromise with expediency, fair but

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ruthless to an opponent, loyal and kindly to a friend or a subordinate whom he trusted. His mind was alert to grasp the essentials of a problem, and to lay down the principles of the solution; but he expected his juniors to work out the details—giving them unstinted encouragement when the project was accomplished. "He was," writes A.D., "a genial but exacting chief. He left a great deal to his staff but always supported them when they ran into difficulty. . . . His former colleagues mourn the loss of a great-hearted friend and a truly great man." Another of his old associates recalls how County Hall would echo to his resonant and cheery "Hello, my boy."

"To Sir Frederick all the staff of his department were his 'boys' (or girls). His cheery manner, and his assumption that he knew them all individually, prevented anyone from feeling ill at ease when summoned to attend his office. Anybody who worked closely with him could not help but admire both the sureness of his judgment and the confidence with which he faced the major problems confronting him. Although intolerant of fools, and at times impatient with those inclined to argue, he was generous in his estimate of those who thought they had a conviction and were prepared to fight for it. He accepted respect for his position and for his views as a matter of right, but beneath it all was a great love and interest for his fellow men. A family illness affecting any of the staff of his department was to him a matter of personal concern, demanding, if necessary, that his influence be brought to bear to secure the best possible medical treatment. With such a chief it was inevitable that the prestige of the public-health department should rank high in the service of the London County Council."

His influence was, indeed, immense, and it was not confined to County Hall. A master of committee technique, he was generous in this form of service. As a hospital administrator he showed himself a good friend of the nursing profession, and he represented the Ministry of Health on the Central Midwives Board, and was a member of the interdepartmental committee on nursing, the General Nursing Council, and the departmental committee on the training of midwives. During his life he was always adding to his interests, but he never lost sight of his earlier work. Thus he served on the Trevethin Committee on venereal diseases and he was a member of the council of the National Association for the Prevention of Tuberculosis. He was chairman of Queen Mary's (Roehampton) Hospital, the Burrow Hill Colony, Frimley, the Home Service Ambulance Committee, and, for a time, of the Central Council for Maternity and Child Welfare; and he sat on the council of King Edward's Hospital Fund, the medical advisory committee of the Nuffield Provincial Hospitals Trust, and the management committees of the London and St. Thomas's Hospitals. In the conception and development of the British Postgraduate Medical School he played a leading part, and he was a member of its governing body.

With all this he remained at heart a countryman. He was an expert in estate management, and until 1934, when he had a serious illness that left him unable to walk more than short distances, nothing gave him greater pleasure than a day in the open air with a gun and a dog. After he sold his Norfolk estate he lived in London. The war years, however, he spent in his native Caernarvonshire. Moving to Criccieth with his family, he took over the supervision of the Red Cross hospitals and convalescent homes in North Wales organised by the Red Cross and the Order of St. John of Jerusalem, of which he was a Knight of Grace.

"It was at Criccieth," writes S. W. P., "that the full fruition of the man came, and this was probably the part of his life that he enjoyed most. He returned to the congenial surroundings of his childhood, and developed a routine which made the public servant more genial and more approachable.

"After breakfast he would retire to his study and deal with a voluminous correspondence. He wrote his letters himself, and many will remember the closely written double-sided letters in the characteristic hand. His precise mind was mirrored in the substance of the letter, in which he made his points concisely and clearly. A walk before lunch brought many contacts with the people of the town; all knew that tall smiling figure on the promenade, and for most there was a kindly greeting or an encouraging word. After lunch he was out again if the weather was good. It was his custom twice a week to go and have tea with Lewis Smith, who would read him a new article on fishing by the 'Silver Doctor,' or would go through what seemed to interested visitors an interminable lot of clippings from the current medical journals. Once a week he would have tea with Lloyd George, and listen to the old lion's stories, told with twinkling eyes and that incisiveness that showed vestiges of the vigour of the past; or with Thomas Carey Evans who had been associated with him at the Postgraduate School. Once or twice a month the routine was interrupted by a visit to London for committee meetings or a tour of inspection through North Wales."

After the war he returned to London and engaged in an increasing amount of voluntary work, so that in 1948 he wrote that he had never been so busy in his life. By seniority and ability he attained the chairmanship of many of the committees on which he served. There are many younger men who will hold in high regard the memory of one who, when asked, never failed to give his best in counsel.

Sir Frederick was appointed K.B.E. in 1932, and the following year Edinburgh conferred on him the honorary degree of LL.D. In 1937 he was the first M.O.H. to be appointed an honorary physician to the King. In 1941 the Royal College of Physicians of London, to whose fellowship he had been elected in 1932, awarded him the Bisset-Hawkins gold medal. He also received the Cullen prize from the Royal College of Physicians of Edinburgh.

He married Harriet May, eldest daughter of the late E. Honoratus Lloyd, K.C., who survives him with a son and a daughter. Their elder son, a Regular soldier, was killed in Normandy during the late war.

DAVID LLEWELYN WILLIAMS

C.B.E., M.C., LL.D. WALES, F.R.C.S.E.

Dr. D. Llewelyn Williams died at Liverpool on May 12 in his 80th year. From 1920 until his retirement in 1935 he was medical member of the Welsh Board of Health and the senior medical officer of the Ministry of Health in Wales.

The youngest son of the Rev. John Williams, a Welsh Presbyterian minister, whose charge consisted of three small chapels in the beautiful Vale of Conway, he was educated at Llandudno Collegiate School. After some years as a pharmacist, he entered Surgeons' Hall, Edinburgh, in 1895, where he took every medal and prize in each class he attended. In 1901 he qualified, and after holding house-appointments at the Royal Infirmary, Edinburgh, and at Leith General and Fever Hospitals, he took the F.R.C.S.E. in 1904 and the D.P.H. the following year.

In 1905 he was appointed medical officer of health for Wrexham, and two years later he became medical officer of health for Denbighshire—the first county medical officer in Wales. When the National Insurance Commission for Wales was formed in 1912 he was invited to join as deputy medical officer.

In 1914 he joined the R.A.M.C. and himself raised the hygiene section of the 38th (Welsh) Division, serving with the rank of captain. For gallantry at Mametz Wood he was awarded the Military Cross, and the President of the French Republic also honoured him for his work for French civilians behind the lines by awarding him the Médaille des Epidémies and the Médaille de la Reconnaissance Française.

Throughout his life his great interest was in youth and education. He was a member of the court of the University of Wales for many years and was vice-chairman of the council of the Welsh National School of Medicine from its creation in 1930. The university recognised his services when the honorary degree of LL.D. was conferred on him in 1947. He had also been associated with the Welsh National Memorial for the Prevention and Treatment of Tuberculosis since its inauguration in 1912, serving on the council and on many committees.

A colleague writes: "Llewelyn Williams will be remembered as a great administrator; the smooth running of the old National Health Insurance scheme in Wales was due in no small measure to his qualities of tactful diplomacy and his never-tiring good humour. He knew every general practitioner in Wales personally and

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he travelled the length and breadth of the country, especially in the early years, and did much to smooth out the difficulties of the hard-pressed general practitioner confronted with a mass of Government regulations. His was never the official approach but the personal friendly human touch. A deeply religious man, he was an elder of his church and spoke up and down the land on temperance and purity to enthusiastic gatherings of young people. On his retirement in 1935 he was appointed a member of the commission sent out by the Presbyterian Church of Wales to investigate their mission fields in India."

When the second world war came in 1939 Llewelyn Williams, though now 70, worked unceasingly on medical boards, making the difficult journey to Wrexham on six days a week from his pleasant home at Old Colwyn. His wife died last year, and he leaves two sons and a daughter.

Appointments

HUGHES, K. E. A., M.B.E., M.R.C.S.: bacteriologist, Portsmouth. and I.W. area pathological service.

POST, H. W. A., M.D. Lond., D.M.R.E.: visiting radiologist i.c. diagnostic and superficial therapy department, Royal Masonic Hospital, London.

Births, Marriages, and Deaths

BIRTHS

BLACHFORD.—On May 10, in London, the wife of Dr. R. D. Blachford—a daughter.

BRINTON.—On May 15, in London, the wife of Dr. W. D. Brinton—a daughter.

BURTON.—On May 3, in London, the wife of Dr. John Burton—a daughter.

CAIRNS.—On May 9, at Oxford, the wife of Dr. H. J. F. Cairns—a son.

CLAY.—On May 7, at Ilkley, the wife of Dr. H. F. Clay—a son.

COBBE.—On May 9, in London, the wife of Dr. C. J. Cobbe, M.B.E.—a son.

EVANS.—On May 11, in London, the wife of Dr. M. L. H. Evans—a daughter.

FRIEDLANDER.—On May 15, in Manchester, to Dr. Jean Broughton, wife of Dr. H. A. Friedlander—a daughter.

FYFE.—On May 12, at St. Andrews, Fife, the wife of Dr. G. M. Fyfe—a son.

GILBERT.—On May 9, at Purley, the wife of Dr. E. T. Gilbert, D.S.O., O.B.E.—a son.

GODBER.—On May 8, in London, the wife of Dr. Greville Godber—a son.

HUDSON.—On May 13, in London, the wife of Dr. J. R. Hudson—a son.

MCMILLAN.—On May 9, at Northampton, the wife of Dr. James McMillan—a daughter.

MARTYN.—On May 12, at Sale Moor, the wife of Dr. Gwyn Martyn—a daughter.

METCALF.—On May 8, at Wimbledon, the wife of Dr. James Metcalf—a daughter.

MITCHELL.—On May 6, in London, the wife of Dr. Malcolm Mitchell—a son.

OWEN.—On May 9, in London, the wife of Dr. M. L. Owen—a daughter.

PRICE.—On May 9, at Bournemouth, the wife of Dr. G. C. Price—a daughter.

SELDON.—On May 7, in London, the wife of Dr. W. A. Seldon—a son.

SIDES.—On May 7, at North Walsham, Norfolk, the wife of Dr. J. R. Sides—a son.

STEPHENS.—On May 10, at Farnborough, Kent, the wife of Dr. B. J. Stephens—twin sons.

MARRIAGES

CROWLEY—FRANK.—On May 7, in Surrey, Alan Fergus Crowley, M.B., to Margaret Frank.

SMITH—GANDERTON.—On May 14, at Chislehurst, David Wassell Smith, M.R.C.S., to Lucy Marian Ganderton.

DEATHS

ATKINSON.—On May 7, Hugh Norman Crowley Atkinson, M.R.C.S.

BRASHER.—On May 11, at St. Leonards, Charles William James Brasher, M.D. Brist., aged 83.

CLARK.—On May 10, at Spital, Bromborough, Cheshire, George Clark, M.B. Lpool, D.T.M., D.T.H., D.P.H.

COURT.—On May 3, at Inverness, Edward Percy Court, M.R.C.S.

GOSS.—On May 12, at Plymouth, Leslie Stewart Goss, O.B.E., surgeon captain, R.N. retd.

MACKAY.—On May 8, in Edinburgh, George Mackay, M.D. Edin., F.R.C.S.E.

MENZIES.—On May 14, in London, Sir Frederick Menzies, K.B.E., M.D. Edin., F.R.C.P., F.R.C.P.E., F.R.S.E., D.P.H., aged 73.

Notes and News

SOCIETY OF APOTHECARIES OF LONDON

ON May 11 the society bestowed its gold medal in therapeutics upon Prof. Jacques Tréfouël, director of the Institut Pasteur, and the freedom of the society, honoris causa, upon Sir Charles Harington, F.R.S.

Prof. E. C. Dodds, F.R.S., the master, spoke of the outstanding work of Professor Tréfouël, and reminded his hearers that among the distinguished recipients of the society's medal was Prof. Ernest Fourneau, whom Dr. Tréfouël was proud to call his master. The workers at the Pasteur Institute had developed a study of the fundamental laws governing the science of chemotherapy, and it was by applying these laws that Professor Tréfouël was able to make his brilliant discovery that the chemotherapeutic effect of the German drug, 'Prontosil,' was not due to the whole of the elaborate molecule, and that only a small and relatively simple part was the essential therapeutic agent. In this way sulphanilamide was demonstrated as the active principle, and from this discovery arose the whole of that vast collection of drugs known as the sulphonamide group. There could be little doubt that this was the greatest single advance in therapeutics of all time. In giving the medal to Professor Tréfouël the master said: "Vous, Monsieur Tréfouël, d'une touche typiquement française, vous avez divisé la pesante molécule teutone, en avez rejeté la part inutile et avez clairement mis en lumière le veritable agent thérapeutique, le sulfamide."

In conferring the honorary freedom on Sir Charles Harington, the master referred to his classical researches leading to the classification of thyroxine and later, together with his colleagues, to its synthesis. Like all great discoveries, Sir Charles Harington's observations on thyroxine steadily increased in importance with the passage of time. Undoubtedly none of the brilliant work on labelled iodine which now graces the pages of the scientific journals would have been possible but for these fundamental researches. Furthermore, Sir Charles had brought the principles of pure chemistry to the science of immunity with great success.

Sir Charles Harington, returning thanks, called attention to the fact that biochemists—especially as concerns the latter part of their name—are the descendants of the ancient apothecaries. The ceremonies were followed by a soirée at which the guests included the French Ambassador and the president of the Royal Society.

SCIENTIFIC INFORMATION SERVICES

LAST year the Conference on Scientific Information [1] convened by the Royal Society proposed that an information services committee should be established; and the Royal Society has set up such a committee under the chairmanship of Sir Alfred Egerton, F.R.S.

In his Aldred lecture at the Royal Society of Arts this week, Sir Alfred Egerton estimated that each year about a million scientific papers are published, and the number is increasing; while the latest *World List*, which appeared in 1937, mentions some 36,000 periodicals concerned with scientific and technical subjects. This, he said, need cause no alarm "if the important papers appear in a limited number of easily accessible periodicals and if the others are sufficiently well sifted by the organisations responsible for abstracting and indexing." As far as possible all new original work should appear in established journals, and new journals should not be created unless the need is proved. There is room for collaboration between editors; and already the conference has borne fruit in coöperation between editors of a number of biological journals. The key to furnishing the scientist's needs lies in improving library and documentation services. Workers often require personal copies of articles; and the committee has drawn up, and the Royal Society approved, a draft declaration regarding copyright for use by libraries seeking to reproduce articles at the request of individual readers. Otherwise, Sir Alfred Egerton, concluded, further improvement may result from research into how scientific information is used and how it can best be classified; from bettering the abstracting services through increased coverage, more precise classification, and greater speed in the issue of abstracts; from the arrangement by libraries for the issue of 'Photostat' copies; from strengthening and coördinating the library system and

1. See *Lancet*, 1948, ii, 73.

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providing bureaux of documentation in connexion with the central libraries; from greater use of scientific and technical information officers; and from providing enough funds to maintain a high standard of scientific publication, of abstract journals, and of library and documentation services.

A HOSPITAL JOURNAL MATURES

FIFTY years is a good round age for a hospital journal. The *Broad Way*, of Westminster Hospital, which appeared in April in its jubilee regalia, is a running commentary on the life of the medical school, thrown off with the vitality that belongs to students. As Mr. Walter Searle writes in his appreciation of the journal, "High literary merit cannot be expected, and a humorous, pungent standard is the aim." This the *Broad Way* achieves easily; and with Sir Adolphe Abrahams as a regular contributor it can fairly claim to achieve the unexpected as well. We wish the dynasty of editors good luck in the next fifty years, and after.

CAMBRIDGE GRADUATES MEDICAL CLUB

THIS club, which was founded in 1883, will hold its annual dinner in Cambridge in July. The council believes that many Cambridge men who graduated in the war years are unaware of the club's existence. The objects of the club are to further the interests of the medical and natural-science schools of the university and to promote good fellowship among its graduates. Medically qualified male graduates are eligible for election, the fee for life membership being one guinea. Those interested should get in touch with their hospital representative or with one of the hon. secretaries, Dr. R. A. Hickling (99, Harley Street, London, W.1) and Dr. A. Willcox (66, Harley Street, W.1).

CONFERENCE OF HOSPITAL LIBRARIANS

THE Guild of Hospital Librarians, which publishes the *Book Trolley*, a record of hospital library work throughout the world, held its annual meeting in London on May 11, when Dr. Letitia Fairfield was elected chairman. The relation of voluntary to professional librarians has been defined by Mr. J. L. Thornton, librarian of St. Bartholomew's Hospital medical college (*Library World*, March, 1949, p. 175): "Public libraries could supply books, and possibly the supervision and advice of trained staff; but without the coöperation of the voluntary workers, who have gained experience during many years' contact with patients, little progress can be made." At the meeting Mr. Thornton observed that few hospital management committees have plans for providing medical and nursing staffs with professional literature. An exception was Bristol, where, through the coöperation of library and hospital authorities, Southmead Hospital now has a library designed for the needs of the whole staff and for patients of all types.

IMAGINARY INTERVIEW

OLD school-books were often written as a dialogue between a tutor and his pupils; and agreeable reading they made, far more tolerable than a page of cold print. What is the use of a book, thought Alice, without pictures or conversations?

Dr. D. E. Parry Pritchard has used dialogue to set out some facts about the county health services for visitors to an exhibition arranged by the Caernarvonshire county health department. The interview is between the county medical officer of health (himself) and an "Inquiring Citizen"; and Dr. Pritchard has the trick of writing dialogue. The hard-headed reasonable Welsh father of seven comes to life, considers what he is told, and grants it his guarded approval. The opening conversation will give the flavour:

C.M.O.H.: Good evening, may I have a chat with you?
Inquiring Citizen: What for? I don't like officials.
C.M.O.H.: Well, I thought you might be interested in the health services provided for you by the county council.
I.C.: County council indeed! All I know is that they have lots of officials for whom we pay rates.
C.M.O.H.: But you do get something in return for your rates?
I.C.: Only threatening letters when I don't pay them.

Thus discouraged, the doctor proceeds to tell him what he gets for his rates—the maternity clinics which his wife attends (and their cost is discussed), the school health services, the fine record of the County Hospital at Bangor (no maternal deaths in a recent year), the fall in the infant-mortality rate, the provision of extra food and vitamins for mothers, the midwifery and health visiting services, and so on. The interview has been published as a brochure, and ends with graphs showing the decline in infant mortality and tuberculosis death-rates, and the increasing heights and weights of school-children at various ages. It seems a pleasant and effective way of spreading the light, which other counties might like to follow.

University of Cambridge

On May 7 the following degrees were conferred:

M.D.—V. N. Fenton, R. J. F. H. Pinsent.
M.Chir.—H. W. A. Baron.
M.B., B.Chir.—B. K. Madden,* G. B. Barker.
* By proxy.

University of Bristol

At a recent examination for the diploma in medical radio-diagnosis the following were successful:

Part I.—A. C. E. Cole, J. B. Fox.
Part II.—J. H. E. Bergin, W. R. Cole.

University of Dublin

Prof. Geoffrey Jefferson, F.R.S., will deliver the John Mallet Purser lecture at the school of physic, Trinity College, on Thursday, May 26, at 4 P.M. He has chosen as his subject Descartes on the Localisation of the Soul.

Royal College of Surgeons of England

At a meeting of the council held on May 12, with Lord Webb-Johnson, the president, in the chair, the honorary medal of the college was awarded to Prof. F. Wood Jones, F.R.S., Prof. W. E. Gye, F.R.S., and Mr. Arthur Sims, who endowed the Commonwealth travelling professorship. The Jacksonian prize was presented to Mr. H. L. M. Roualle, the John Hunter medal and triennial prize to Mr. P. M. Daniel, and the Begley prize to Mr. W. H. McBay. A Leverhulme research scholarship was awarded to A. T. Andreasen.

Dr. A. Wai-tak Woo, Mr. R. J. Cann, Prof. T. Yeates, and Mr. A. B. Nutt were admitted to the fellowship, having been elected as medical practitioners of 20 years' standing. Diplomas of membership and diplomas in tropical medicine and hygiene and in child health were granted to those named in our report of the comitia of the Royal College of Physicians (*Lancet*, May 7, p. 806). A diploma in physical medicine was also granted to M. Fletcher.

The Osler Club

At the 83rd meeting of this club on May 13, Dr. D. Evan Bedford gave an illustrated address entitled the Ancient Art of Feeling the Pulse, in which he reviewed the history of pulse-taking, from the Chinese physicians, who wrote on the subject two thousand years before Christ, to Sir James Mackenzie's work, published at the beginning of this century. He also showed books on the subject from his own library. Mr. Geraint Griffith gave a biographical sketch of Sir James Mackenzie, and Mr. Peter Thomas spoke on Inventors of the Sphygmograph. Lord Amulree spoke briefly of Mackenzie, and demonstrated his uncle's original polygraph together with some of his tracings and notebooks.

Chelsea Clinical Society

At this society's annual dinner in London on May 10, Mr. H. G. Strauss, M.P., chided doctors for using abstruse jargon. The habit of adopting initials for medical terms was mischievous and lost more time than it saved. And what, he asked, of the extraordinary word "hospitalised"? Did this not mean "converted into a hospital"; and when the patient was leaving hospital was he to be "dehospitalised" or simply "homised"? In this matter of jargon the Services were not blameless; for here people were "relegated to disembodiment," and it had been said that "officers are achieving redundancy." There had been talk, too, of a "heavy-calibre bomb," which was about as sensible as saying that a man weighed 6 feet. Speaking of the society, Mr. Strauss observed: "It will be a bad day for all of us when the individual and the State are considered all the entities that matter." In reply, Mr. Nils Eckhoff, the retiring president explained that the society aimed to discuss topics that were on the fringe of medicine; among the subjects considered in the last year were empiricism in medicine, chiropody, and films. For the guests, Air Marshal Sir Richard Peck and Dr. Reginald Hale-White replied to a toast proposed by Mr. Frank Cook, who declared that the society's main feature was its variety—including variety in membership. Dr. Maurice Bewley was inducted as the new president.

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Medical Art Society

The annual exhibition will be held at Walker's Galleries, 18, New Bond Street, London, W.1, from Friday, May 20, to Thursday, June 2.

Physiology of Vision

Prof. Hamilton Hartridge, F.R.S., will deliver four lectures on this subject at Gresham College, Basinghall Street, London, E.C.2, on May 23, 24, 25, 27, at 5.30 P.M. Further particulars will be found in our advertisement columns.

Jenner Bicentenary Exhibition

On May 17 Sir Henry Dale, O.M., opened at the Wellcome Historical Medical Museum, 28, Portman Square, London, W.1, an exhibition commemorating the work of Jenner and his influence on the rise of immunology. The exhibition will remain open till June 30.

M.R.C. Committee on Analgesia

The membership of this committee, whose formation we announced last week, is as follows: Sir William Gilliatt, F.R.C.O.G. (chairman), Dr. Josephine Barnes, Dr. F. H. K. Green, Prof. A. D. Macdonald, Prof. R. R. Macintosh, Dr. G. S. W. Organe (secretary), Prof. E. A. Pask, and Dr. Albertine Winner.

Irish Medical Schools and Graduates Association

At a meeting in London on April 21, an Arnott memorial medal was presented, by Colonel George Moore, to Mr. Johnston Abraham, president of the association. It was agreed that the association, which was founded in 1878 but has held no functions since 1938, should resume its activities. Those qualified to join are asked to write to one of the secretaries, Dr. J. Bodkin Adams (6, Seaside Road, Eastbourne), and Mr. W. McKim H. McCullagh (149, Harley Street, London, W.1).

Radioactive Substances Advisory Committee

The Minister of Health, the Secretary of State for Scotland, the Minister of Supply, and the Minister of Health and Local Government for Northern Ireland have appointed this committee to advise them on measures to safeguard workpeople and the public generally against the danger of exposure to radiation from radioactive substances and certain irradiating apparatus. The members are:

Sir Henry Dale O.M., F.R.C.P., F.R.S. (chairman), J. P. Baxter, PH.D., W. Binks, F.INST.P., Sir Ernest Rock Carling, F.R.C.P., D. G. Catcheside, Lord Cherwell, F.R.S., Sir John Cockcroft, F.R.S., Prof. Norman Feather, F.R.S., L. H. Gray, PH.D., Captain Mark Hewitson, M.P., J. F. Loutit, D.M., Prof. W. V. Mayneord, D.SC., Prof. R. McWhirter, F.F.R., E. R. A. Merewether, F.R.C.P., Ralston Paterson, F.F.R., H. S. Souttar, F.R.C.S., Sir George Thomson, F.R.S., Prof. B. W. Windeyer, F.F.R.

The Dentist and the National Health Service

The National Health Service has now been in operation for almost a year, and about 90% of the dentists who are in active general practice in England and Wales, and a still higher proportion of those in Scotland, are taking part in it. Speaking at the opening session of the Dental Board on May 11, Dr. E. W. Fish, the chairman, pointed out that for the first time a dentist is now free to give a patient sound conservative or remedial dentistry, regardless of his ability or willingness to pay. That sounded like the fulfilment of their highest aspirations, yet many dentists found themselves in a quandary through the increased demand from almost every class of the population for every type of dental service. The allocation of public money to his own and his patients' use was a new responsibility calling for a new attitude of mind, and the question was not, therefore, whether dentists would condescend to work this service, but whether as individuals and as a profession they had the capacity for self-discipline, the ethical training and the philosophy to rise to those heights of altruism which the service demanded. "Indeed for many of us," he continued, "there is not even the possibility of choice . . . the service is here, and in some form or other will remain for as long as civilisation lasts in this country. Whether it succeeds or fails must depend . . . upon our willingness and our capacity to sacrifice what may be legitimate personal gain for the salvation of our self-respect and the honour of our calling."

Streptomycin Royalties for University

Dr. Selman Waksman, the discoverer of streptomycin, has presented $1,250,000, representing the amount which patent rights on the drug would bring him, to Rutgers University, New Brunswick. The university will use the money to establish an Institute of Microbiology, with Dr. Waksman as its first director. According to B.U.P., royalties on the drug, computed on a basis of 2½% of the sale price, totalled last year between $700,000 and $800,000.

Training Grants for Assistants

After consulting the general medical services committee of the British Medical Association, the Minister of Health has decided that these grants shall not be paid in respect of assistants liable and fit for military service. A Ministry letter (E.C.L. 187) to executive councils explains that "newly qualified doctors liable for such service should continue to be encouraged to take hospital appointments before their period of military service." The conditions governing grants for assistants were announced last year (see *Lancet*, 1948, ii, 656, 712).

Sir Howard Florey, F.R.S., who is visiting Greece this month on behalf of the British Council, will deliver two lectures to the medical faculty of the University of Athens.

CORRIGENDUM: *L'Oeuvre Grancher*.—In this article of May 7 (p. 795) the mortality figure for 4000 children boarded out was given as 0·01%; this should read 0·1%. All the figures quoted refer to children observed from birth up to 15 years of age. The figures for children remaining with contagious parents were derived from an unknown number, and apply to the conditions when l'Oeuvre Grancher was founded in 1904. Today the comparable mortality is about 10%.

Diary of the Week

MAY 22 TO 28

Tuesday, 24th

UNIVERSITY OF LONDON
5 P.M. (London School of Economics, Houghton Street, W.C.1.) Sir James Ross: National Health Service. (Last of three lectures.)
5.30 P.M. (Westminster Medical School, Horseferry Road, S.W.1.) Prof. Rudolf Brdička (Prague): Applications of Polarography to Medicine. (First of two lectures.)

ST. MARY'S HOSPITAL MEDICAL SCHOOL, W.2
5 P.M. Dr. M. R. Pollock: Bacterial Nutrition. (Fourth of six Almroth Wright lectures.)

INSTITUTE OF DERMATOLOGY, 5, Lisle Street, W.C.2
5 P.M. Dr. W. H. Goldsmith: Choice of Vehicles for Topical Application.

EUGENICS SOCIETY
5.30 P.M. (Burlington House, Piccadilly, W.1.) Prof. H. J. Fleure, F.R.S.: Biological Considerations in Social Evolution.

Wednesday, 25th

HARVEIAN SOCIETY OF LONDON
5 P.M. (Royal College of Surgeons, Lincoln's Inn Fields, W.C.2.) Sir Gordon Gordon-Taylor: The War Collection. (Harveian lecture.)

Thursday, 26th

UNIVERSITY OF LONDON
5.30 P.M. (Westminster Medical School.) Professor Brdička: Applications of Polarography to Medicine. (Second of two lectures.)

ST. GEORGE'S HOSPITAL MEDICAL SCHOOL, S.W.1
4.30 P.M. Dr. Desmond Curran: Psychiatry lecture-demonstration.

MEDICO-LEGAL SOCIETY
8.15 P.M. (26, Portland Place, W.1.) Major A. K. Mant, M.R.C.S.: Medical Services in Ravensbrück Concentration Camp.

HONYMAN GILLESPIE LECTURE
5 P.M. (University New Buildings, Teviot Place, Edinburgh.) Dr. J. Halliday Croom: Outlook for the Diabetic.

Friday, 27th

BRITISH TUBERCULOSIS ASSOCIATION
2 P.M. (Medical Institution, Mount Pleasant, Liverpool.) Opening of Joint Meeting with the North Western Tuberculosis Society.

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MAY 28, 1949 PAGES 895 TO 942

THE LANCET

A JOURNAL OF BRITISH AND FOREIGN MEDICINE, SURGERY, OBSTETRICS, PHYSIOLOGY, PATHOLOGY, PHARMACOLOGY, PUBLIC HEALTH, AND NEWS

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THE RADIOLOGY OF RHEUMATIC HEART DISEASE *

Sir JOHN PARKINSON
M.D. Lond., F.R.C.P.
PHYSICIAN TO THE NATIONAL HEART HOSPITAL; CONSULTING PHYSICIAN TO THE CARDIAC DEPARTMENT OF THE LONDON HOSPITAL; CONSULTING CARDIOLOGIST TO THE ROYAL AIR FORCE

With illustrations on plate

THE name of Carey Coombs will remain associated with this City and University of Bristol of which he was a distinguished citizen and member, and with rheumatic fever and heart disease in children, the subject to which his life was largely devoted. Yet his interests were wider still, and of his many contributions to medicine I will only mention, apart from his pathological and clinical research in rheumatic fever, his observations on angina pectoris (Coombs 1929–30), his Lumleian lectures on Syphilis of the Heart and Great Vessels (Coombs 1930), and a masterly critical review on the same subject, published in 1932, the year that he died.

He was an excellent physician, an inspiring teacher of medicine, and a gracious and generous-minded man. His outstanding book on *Rheumatic Heart Disease*, published in 1924, is a monograph containing the results of his own observations on rheumatic fever and its effects on the heart (Coombs 1924). Appreciation of his work has grown, not diminished; and we feel it a just testimony to read in the standard American book on the subject "We owe most of our recent knowledge of the histology of rheumatic heart disease to Bulloch and to Coombs" (Wilson 1940).

Despite the passage of time, the basic work on the pathology, clinical course, and public control of rheumatic fever which we owe to Carey Coombs has never lost its value, and the Bristol tradition is well maintained. Today my intention is to indicate how that growing knowledge has since been supplemented by the application of radiology to the study of rheumatic heart disease.

THE NORMAL CARDIAC OUTLINE

As you are familiar with the X-ray picture of the normal heart, I propose to touch first on the advances made during recent years in identifying more surely the several parts of the outer contour, and, what is equally important, the situation of the valves and the extent of the chambers lying within that contour. This has been made possible by the results of pioneer work in angiocardiography: the injection of an opaque substance (diodone) through an arm vein into the living human heart followed by rapid serial radiography to catch the stages in its passage through the heart. Progress in this technique, and in catheterisation of the heart, will by its wider use soon alter, and it will greatly extend, our present concept of the mechanics of the heart and its living internal anatomy and pathology. Nevertheless I have striven to bring more up to date some diagrams of radiological anatomy which Dr. D. Evan Bedford and I produced some years ago; and today I submit them in a revised form. My purpose is to present a simple pictorial statement of current opinion on the radiological anatomy of the normal heart as it may be seen by radioscopy in the three customary positions (fig. 1). Information obtained from published angiocardiograms has been applied to some extent though with diffidence, because further experience may show these diagrams to be faulty and even misleading.

* Carey Coombs Memorial Lecture delivered at the University of Bristol, Jan. 27, 1949.

Pulmonary Arc.—As examples of changing opinion on the topography of the normal heart, one may quote the structure of the left middle arc and the position of the valves. The left middle arc of the cardiac contour at the hilum of the lung—i.e., the pulmonary arc—has hitherto been regarded as the pulmonary artery itself, but there is now little doubt that the arc is largely formed by its left branch (Chávez et al. 1947). That left branch, if apposed to the main stem of the pulmonary artery, may indeed project enough to suggest that there is abnormality of the pulmonary artery when there is none; and this applies especially to the healthy young adult with a vertical heart (Sussman and Grishman 1947). There is least movement in the strip of the left contour immediately below the pulmonary artery, which is between it and the left ventricle, and that strip is formed by the left auricular appendage.

Valves.—The situation of the valves in relation to the cardiac contour has been settled by studies of calcified valves in life and by angiocardiography. No longer may we speak of the "aortic area" as if the aortic valve is subjacent to the second right interspace, for it is far away from it. The aortic valve lies much lower, almost in the centre of the heart shadow as seen from in front, and in the middle line or to the left of it. This makes it less surprising that an aortic diastolic murmur is so often best heard "to the left of the sternum." The mitral valve is close to it, a little lower and to the left.

CARDIAC ENLARGEMENT IN RHEUMATIC FEVER AND CARDITIS

"If the heart of a child dying during an active phase of cardiac rheumatism be looked at, the fact that will at once strike the observer is the enlargement of the ventricles." The heart dilates, and it also increases in weight, even if there is no valvular sclerosis. That was a general statement by Coombs (1924) referring to carditic enlargement. We are reminded how closely our predecessors related clinical to necropsy findings, and might thereby incline more to study the established disease. Enjoying the advantages we possess in surer physical and laboratory signs, are we now rather more concerned with the early recognition of a disease? If not, we should be.

Left Ventricle

The left ventricle does not for our convenience enlarge only *outwards*; if it did, the position of the apex-beat would have far greater value clinically than it has, and radioscopy solely in the anterior position would suffice. No, it enlarges also in depth—i.e., *backwards*, and backwards more than outwards. Thus, with enlargement, the bulk of the left ventricle is turned towards the spine, "and only a relatively small section participates in the formation of the anterior wall of the heart" (Dressler 1940). Of children it has been said that "the early enlargement of the left ventricle is usually posterior and can therefore be seen best in the oblique position" (Wilson 1940).

A special technique for estimating in this position the size of the left ventricle was introduced years ago by Vaquez and Bordet (1928) and called the angle of disappearance of the apex. The subject is rotated to his right—i.e., into the left oblique position (fig. 1*a*)—until the left ventricle is seen to clear the spine; hence the method is now called the angle of clearance. The angle is that which the biscapular line of the subject makes with the line of the screen, and may be measured by a goniometer if not on a graded turntable on which he stands. An angle over 40° was held to indicate enlargement of the left ventricle in adults. This test has not come into general use, partly because a high diaphragm, or a bent spine, or a flat chest so easily invali-

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dates readings; and it has not found favour in adult cardiological practice (Zdansky 1939, Roesler 1943). It is possible, however, that this angle of clearance can have value when applied to children; Wilson (1940) assesses it highly, though with a very different upper limit of normality—i.e., 55°. She cites control observations on 119 normal children, of whom 97% showed an angle of clearance of less than 55°. Kuttner and Reyersbach (1939), however, found in only 79% of 101 healthy girls (aged 7–15) this angle less than 55°, and they think that 60° would be a safer figure for the upper limit of normal. Further observations on this angle of clearance in normal and rheumatic children seem desirable.

Size and Shape of Heart

Meanwhile it is evident that most workers on the subject rely more on radioscopy in judging the size and shape of the heart than they do on ready-made tables such as those founded on the estimated ratio of cardiac surface area to body-surface area. Apart from the statistical error and their failure in borderline cases, these can take no account of changes in the shape of the cardiac outline which are so full of meaning to those with time to learn. Even the simple cardiothoracic ratio, that between transverse width of the heart and transverse internal width of the chest, which is said to be normally 50%, is of little or no service in the diagnosis of a borderline case. It has some value in an individual patient as an index in the course of enlargement or regression, especially perhaps in infants and children.

Apex-beat

In this matter of enlargement we have lost faith in percussion, or at least it is superseded in accuracy by X rays. Should the apex-beat as a physical sign go the same way? No, for it is far too handy and useful in adult cardiac practice. But it is time to ask whether or not it is worth retaining as an index of early cardiac enlargement in rheumatic or any other fever. Already it has nearly lost what little value it had in congenital heart disease. Then, take for instance the heart under the influence of active hyperthyroidism giving a rapid succession of such sudden thrusts against the thin chest wall that the impulse is felt all too easily beyond the nipple (or mid-clavicular) line whereby a false assumption of enlargement is readily made. The apex-beat is now deceptive, for X rays will show no enlargement, since one can place a shielded finger on the apparent apex-beat and see the heart shadow well within it. Comparable observations can be made during a bout of paroxysmal tachycardia. Similarly, in rheumatic carditis with tachycardia the heart beats against the chest wall in such a way that the apex-beat seems to be displaced when it is not. Moreover, abdominal distension and enlargement of the liver displace it mechanically. So in judging enlargement we want something more precise than the slapping of a racing heart against the thin and elastic chest wall of a rheumatic child.

Radiography Early in Carditis

The idea so widely held and repeatedly expressed that cardiac enlargement is an *early* sign of rheumatic carditis was inferred from a percussion of the heart and a palpation of the apex-beat which often were illusory, backed by the knowledge (true enough) that progressive or mortal carditis is in fact accompanied by enlargement. Is there a radiological answer to this question? X rays have been available for a long time. Do they show that enlargement (so-called acute dilatation) is the rule at the onset of rheumatic carditis? I think not. The truth is that X rays have not even yet been sufficiently applied to the whole problem. Why should children be the last to profit from new methods of investigation as they were when the stethoscope was invented, when the electrocardiograph was applied to myocardial disease, and when X rays came into common use? We have mass radiography of adults, primarily to recognise tuberculosis. Mass radiography of children will reveal unsuspected rheumatic as well as congenital heart disease.

Yet the difficulties are many. It is hard to be sure that we are dealing with the first attack; and, if the apex is much displaced, we are confronted with the effects of long-continued carditis or of valvular disease already installed. It is also hard, in considering enlargement, to exclude the effect of pericarditis, which so often occurs during the first few weeks or even at the onset. Although the amount of effusion is rarely large, there may be a fibrinous deposit and a soggy pericardium to augment the size of the "cardiac" shadow. My feeling is that enlargement is not a sign of any value in the early recognition of rheumatic fever or carditis. The idea was based on unreliable clinical signs and has not yet received any support from X rays. To prove it would require a series of undoubted first attacks in which the clinical and laboratory signs of carditis synchronised with

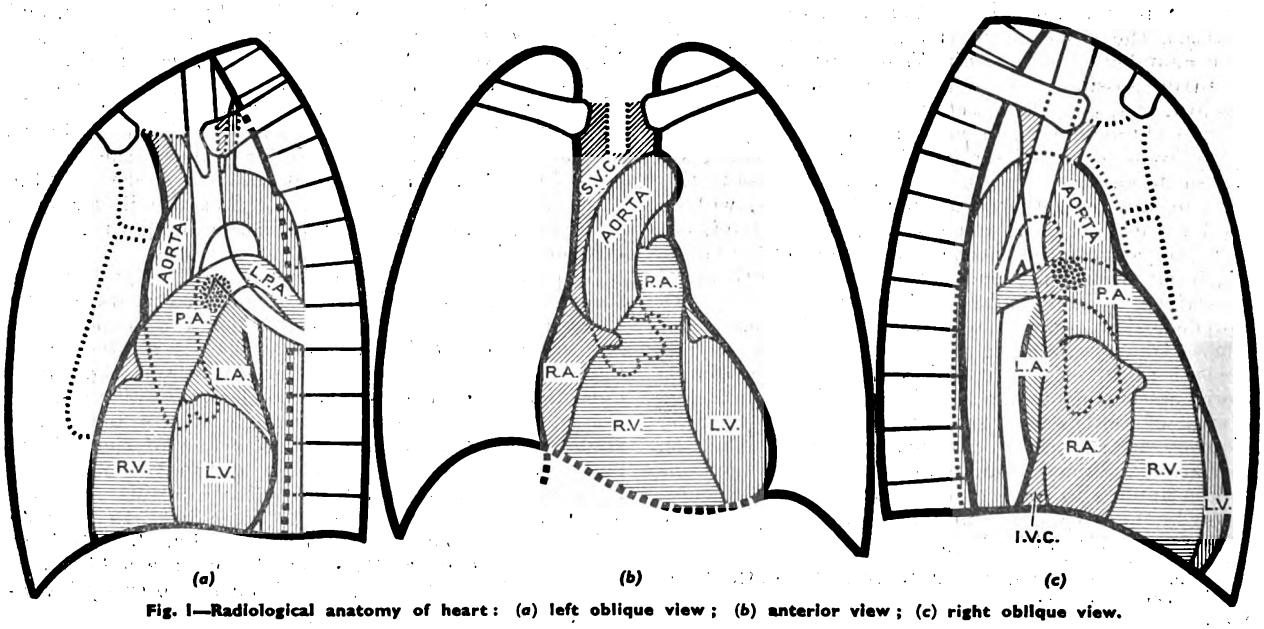

Fig. 1—Radiological anatomy of heart: (a) left oblique view; (b) anterior view; (c) right oblique view.

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demonstrable enlargement. Teleradiograms taken early in the anterior and oblique positions by vertical apparatus fitted above the cots of these children too ill to move might help to provide an answer to the problem.

Radiography in the Course of Carditis

Turning to X-ray observations over months and years *during* the rheumatic infection, one finds a few patient and careful studies. Wilson (1934, 1940, 1946) has had exceptional experience in the X-ray observation of rheumatic children over years, and her book (Wilson 1940) should be consulted. Placing greater trust in the angle of clearance as an index of enlargement than some workers believe warranted, she now avers that "a normal cardiac contour is inconsistent with a diagnosis of active carditis" (Wilson 1946).

Kuttner and Reyersbach (1939) examined the methods available and used radioscopy and teleradiograms in the anterior and left oblique positions, noting the angle of clearance, along with radioscopy in the right oblique after a barium swallow to indicate the size of the left auricle. They concluded that enlargement was shown in the anterior less often than in the oblique view. The left auricle was not always enlarged (displaced œsophagus), even when mitral stenosis was present. They were satisfied that only when the lesion is progressive is the enlargement progressive.

Taussig and Goldenberg (1941) used the method of superimposed teleradiograms and found that active rheumatic infection does not inevitably cause cardiac enlargement, but that it often does. If it does, the enlargement may not progress but remain stationary or it may progress to constitute a serious clinical sign. They were of opinion that enlargement was related to the infection rather than to the accompanying valvular lesion.

Using similar methods, Keith and Brick (1942) found that, of 100 cases, in 33 the heart became larger, in 49 became smaller, and in 18 showed no change. The time taken for these changes in heart size to take place was a matter of months (average 5–6 months); it was not a sudden process. They believed that the development of the valvular element contributes to the cardiac enlargement of rheumatic carditis, a valve affection arising in an early attack adding to the stress in subsequent attacks. Arana and Kreutzer (1942) have published a short monograph with similar studies on 70 children with rheumatic heart disease.

It seems likely, then, that progression and also regression in the size of the heart can occur during the long course of a rheumatic infection of the heart, but that sometimes no enlargement takes place. Electrocardiography, with chest leads distinguishing right and left hypertrophy, may soon add greatly to our knowledge of the process of enlargement in rheumatic carditis and heart disease (Ungerleider and Gubner 1942, First et al. 1947).

CALCIFIED VALVES

Calcification of valves has been a commonplace finding at necropsy for more than a century, but it is only in recent years that its radiological recognition in life has become practicable. It is easier to see this calcification on the screen than to portray it on a film, but progress in radiology is so rapid that soon it will be readily and regularly pictured after being seen. It is time to say that calcification should now be sought whenever a long-standing mitral lesion is present and whenever an aortic valvular lesion is diagnosed or even suspected. The clinical analysis of these valvular lesions may be regarded as incomplete if this is omitted. Fortunately the strange movement of a calcified valve is characteristic, distinguishing it from any extracardiac calcified gland or rib or dense tissue in the neighbourhood. Its site and motion are becoming so familiar that it can be recognised with fair certainty, and a mitral can be distinguished from an aortic deposit by a simple technique now to be described. Sufficient post-mortem evidence in support of this claim has already been gathered (Sosman 1943, Walk 1946).

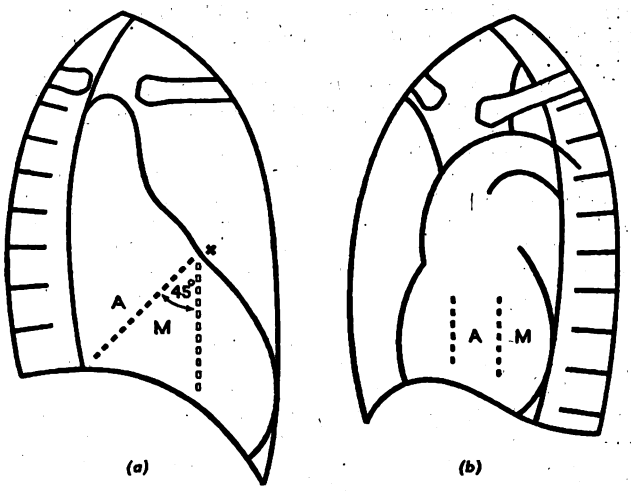

Fig. 2—Site of calcified valves: (a) right oblique position, about 20°; (b) left oblique position, about 50°; A, aortic; M, mitral. (After Sosman.)

Technique

It is to Dr. Merrill C. Sosman, of Boston, that we owe most for guidance on this subject and indeed on valvular calcification in the clinic (Sosman and Wosika 1933, 1934, Sosman 1939, 1943). Inspection of the heart for calcification should not be attempted until the observer's eyes have been adapted in the dark room for a sufficient time, say 15–30 minutes. Failing this, to shorten the requisite time, dark-red goggles may be worn for ocular preparation before entering the dark room. An appropriate current is 5 mA with a 5-in. gap (65 kV) (Sosman 1943). The aperture should be kept small throughout the search and the beam confined to the heart shadow.

Turn the patient slightly to his left—i.e., about 15–20° into the right oblique position. Find the point (or short strip) on the anterior (ventrad) surface of the heart which is the fulcrum of the seesaw movement—retraction below the point and expansion above—in other words, the point between ventricle and pulmonary artery. From this point run backwards and downwards towards the spine an imaginary line 45° to the vertical. Get the patient to take a deep breath and to hold it for a few moments, since this facilitates recognition of the valve. Scrutinise the area in the body of the heart close to the spine, and if calcified the aortic valve may be seen above this line or the mitral valve below it (fig. 2*a*). A good rule, according to Sosman (1939), is to look *through* the heart, watching for the dark dancing shadow. Then it is well to centre one's vision to the side of the shadow, not directly on it, and not to gaze too long nor indeed attempt the search when tired. The calcified valve appears as a small dense shadow with a peculiar movement synchronous with the heart yet more pronounced. It is a sort of down and up movement in the axis of the heart often with something of a swinging or an elliptical course. Once well seen, this oscillation can be readily recalled and identified in subsequent cases.

Having thus recognised the calcified valve in the slight right oblique position (15–20°), one can best distinguish aortic from mitral by turning the patient to his right—i.e., into the left oblique position—to an angle of about 50° or until the left ventricle just clears the spine. The

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aortic valve is found to lie in the middle third, and the mitral valve in the dorsad third of the heart shadow (fig. 2*b*).

Examples of calcified valves recorded by teleradiogram are seen in fig. 3 (aortic) and fig. 4 (mitral).

Movements of Valves

The movements of the calcified valves have been studied by diverse observers, for apart from their diagnostic value they have interest physiologically. Sir Arthur Keith used to teach that the apex movement of the heart was less important and less extensive in systole than the movement of the auriculoventricular junction. This teaching has been amply supported by modern observations on the movement of the calcified valves which are carried by that junction. Thus Wolferth and Margolies (1939) conclude from radiokymographic studies that "the floor of the auricle (roof of the ventricle) ... is pulled vigorously toward the apex during ventricular systole, while the apex is moving toward the base." Odqvist (1948) has recently discussed these movements and says: "The mitral ring, in all probability, goes down and up in a rectilinear course."

The movement of the mitral valve may differ from that of the aortic, but this difference is not great enough to serve in distinguishing one from the other. As a rule, the mass of the mitral-valve calcium is greater than that of the aortic. Comma-like extensions may proceed from the aortic-valve calcium (Donzelot and Heim de Balsac 1945). There is little difficulty in the separation of a calcified valve from the calcified annulus fibrosus which is shown on some radiograms of elderly persons as a horseshoe or circular ring of calcium and has little clinical significance except an occasional relation to heart-block (Rytand and Lipsitch 1946).

AORTIC VALVULAR DISEASE

Carey Coombs (1924) was aware of the high incidence of aortic valvular injury from rheumatic carditis, saying that in general the mitral valve is always affected, the aortic in half the cases. In Cabot's post-mortem series (Cabot 1926) to 107 cases of pure mitral stenosis there were 41 of pure aortic stenosis or incompetence or both. Taking four other collected series of rheumatic valvular disease studied post mortem, in more than a half the aortic valve was involved (Parkinson and Hartley 1946). The clinical lesson is that we should not be complacent after diagnosing mitral stenosis, but should proceed to decide whether aortic valvular disease is or is not combined with it, the chances being that it is.

A different question is the incidence of aortic valvular disease alone; for it is not quite true that the mitral valve is always affected, and alternatively the mitral lesion may be so trifling as not to be clinically demonstrable. Campbell and Shackle (1933) held that aortic incompetence often, not rarely, occurs without mitral stenosis. Among 609 recruits I saw with rheumatic valvular disease, no fewer than 202—i.e., 1 in 3—were clinically examples of pure aortic incompetence, and 27 others had predominant aortic stenosis (Parkinson and Hartley 1946).

AORTIC STENOSIS

Aortic stenosis should no longer be regarded as rare; in fact it is fairly common, and many large series have been published, clinical and post mortem (Christian 1931, McGinn and White 1934, Contratto and Levine 1937, Clawson et al. 1938, Dry and Willius 1939, Karsner and Koletsky 1947, Kumpe and Bean 1948). Modern opinion has moved strongly to the belief that aortic stenosis is nearly always a late product of rheumatic fever, and Karsner and Koletsky (1947) seem to have proved it. It is now less often ascribed to atheroma alone. In children it is oftener congenital than rheumatic and those with subaortic stenosis are more likely to reach adult life than those with congenital valvular stenosis (Brown 1939). Either form may become calcified; and it now appears that there are rare cases of aortic stenosis due to calcified syphilitic valvulitis (Froment and Gonin 1945).

A type of case which has long interested me is that of the man of 60 with full signs of aortic stenosis who comes with a short history of pain or dyspnœa, say for a matter of months. On inquiry he tells of a murmur noticed at the first world war, and at any subsequent medical examination—e.g., for life insurance. Doctors were always interested, even surprised, but he was unconcerned by their discovery for he had never previously had symptoms. Such a story, sometimes backed by that of rheumatic fever in childhood, is characteristic of one type of aortic stenosis.

Generations of students have learned that an aortic systolic murmur and thrill, with absent second sound and a small pulse mean aortic stenosis. And it does—an extreme degree of it! Later they will have to learn that reliance on such gross signs will allow a diagnosis of only a quarter of the cases to be found post mortem. As Osler remarked, no heart lesion is more often latent. How can we make a better show in its diagnosis during life? These are points to be considered. First of all, the murmur need not be loud enough to evoke a thrill. Mackenzie (1925) said "It may be faint—a mere whiff"; and it is usually but not invariably louder at the aortic area than at the apex. Next, the aortic second sound is often present in early cases (Parkinson and Hartley 1946). Lastly, the small pulse and the reduced pulse pressure are not to be expected in the slight or even moderate grades. As we become increasingly aware of the frequency of aortic stenosis and suspicious of its presence, an unexplained systolic murmur at the base and even at the apex, an enlargement of the heart, or a failure of doubtful nature will oftener be elucidated and correctly interpreted. Radiology will often help to clinch the diagnosis.

Radiology

At once one thinks of the left ventricle, which first shows the direct effect of this valvular constriction. The left ventricular border becomes longer and more convex, and the heart more voluminous in this direction (fig. 5). The enlargement is best confirmed in the left oblique position (fig. 7*b*). This change is similar to that seen in aortic incompetence, but without that undue pulsation of both the ventricle and the aorta which is so characteristic of incompetence. Similar left ventricular enlargement is also seen in hypertension, but this gives (in addition) the ovoid enlargement of the aortic shadow consequent upon unfolding of the aorta. Aortic stenosis should therefore be suspected when convexity, prominence, and lengthening of the left heart border is the only radiological feature, unaccompanied by undue pulsation and with little or no enlargement of the aorta, so that the vascular pedicle is relatively small (figs. 5 and 6). I agree with Schwedel (1946) on this point. Master (1942) pictures a good example (his fig. 39). Yet it is also common to see a moderate prominence of the ascending aorta, some dilatation beyond the aortic valvular stenosis (fig. 5), without a corresponding enlargement of the aortic knob. Of course these patients may reach an age when lengthening of the aorta, that diagnostic of arteriosclerosis anywhere, is obvious from the height and prominence of the aortic knob and from the aortic course as seen in the left oblique view.

When aortic stenosis is found clinically, its radiological effect will often be modified or nullified by associated incompetence, when this predominates. However that may be, one must always look for evidence of mitral stenosis in addition, for the rheumatic ætiology of the lesion might then be abundantly proved.

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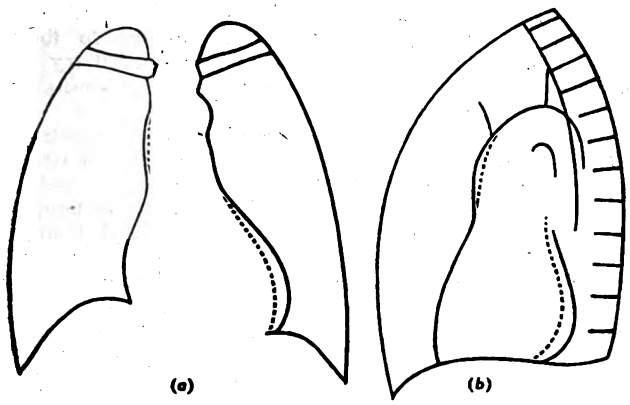

Fig. 7—Early aortic incompetence showing enlargement of left ventricle and slight prominence of ascending aorta: (a) anterior view; (b) left oblique view. Dotted line represents normal outline.

Calcification of the valve seems to be the rule in aortic stenosis, and it is seldom absent in any case of long duration whatever the age of the patient or the ætiology. Age alone does not (or rarely does) calcify this valve to constriction; and the recognition of a calcium shadow moving within the heart at the site of the aortic valve is now becoming as sure a clinical sign as any. When discerned, it is comparable in diagnostic worth with enlargement of the left auricle as evidence of mitral stenosis, that radiological sign which matches in value the auscultatory sign of a presystolic or mid-diastolic murmur. A technique for recognition of aortic-valve calcification has already been described. The method of tomography is also applicable (Weinbren 1946, Davies and Steiner 1949).

AORTIC INCOMPETENCE (RHEUMATIC)

Little is new in the radiology of aortic incompetence, yet this is an opportunity to stress its value in the early diagnosis. Enlargement of the left ventricle need not be present in the first stages, and the early diastolic murmur can be the sole and sufficient sign. What needs to be better known is the fact that occasionally enlargement from aortic incompetence may be present *before* the murmur is heard at all (Hartley 1948). More commonly the sight of enlargement drives one back to more exacting auscultation and so to the finding of a diastolic murmur previously missed. This is no uncommon experience in our cardiac clinics, and it applies also to that common combination of mitral stenosis and aortic incompetence, where the aortic associate is habitually disregarded in clinical practice.

The first radiological signs of aortic incompetence are: (1) an increased convexity of that part of the heart contour formed by the left ventricle; this slight change from the normal, which is well seen in the anterior view can often be verified by inspection in the left oblique view (fig. 7*b*); and (2) a lengthening of the left ventricular contour, which then lies further to the left—i.e., nearer to the left thoracic wall (fig. 7*a*)—and extends lower into the diaphragmatic shadow. This fact may be better appreciated if gas is introduced into the stomach with an effervescent mixture. The length of this left ventricular segment of the contour is measurable from the point of opposite pulsation above (point G of French authors) to the radiological apex below. Experience of the normal is of course a prerequisite to the use of these X-ray signs; moreover, due allowance must be made for conditions which simulate this left ventricular enlargement, such as a high diaphragm, a slight scoliosis, or a natural bradycardia, besides noting that a *right* ventricular enlargement may displace the *left* heart border. Some slight prominence of the ascending aorta, in both the anterior and the left oblique views, fits the picture of early incompetence. Pulsation neither of ventricle nor of aorta is of much value at this early stage, though it does sometimes suggest or support the diagnosis. With more advanced aortic incompetence the large egg-shaped heart comes to lie more obliquely; and, as the aortic knob is prominent, we see a deeper bay between it and the plump apex, quite a contrast to the contour of mitral stenosis with the bay filled in or overfilled.

It has now become the good custom to avoid using the term aortic incompetence alone without indicating its nature—whether rheumatic or syphilitic. At one time we were tempted to regard associated prominence and undue pulsation of the ascending aorta as a feature pointing to syphilitic aortitis as the common basis. It cannot be too well known that dynamic dilatation of an elastic and healthy ascending aorta can be so considerable in free aortic incompetence of rheumatic ætiology that we should be guarded in drawing any such disturbing conclusion from it. It is true that the ascending aorta may be locally and specifically affected by syphilitic aortitis, but more often there is clear evidence of localised dilatation in other parts of the aorta, and of loss of parallelism in its walls—the crucial distinction. Of course it is inexcusable nowadays for the unfolding of the aorta inseparable from established hypertension to be mistaken for aneurysm.

MITRAL VALVULAR DISEASE

Mitral Incompetence

This is scarcely an occasion to reopen the question of apical systolic mumurs, how to decide whether they are innocent or significant of mitral valvular disease. I have previously commented on the problem (Parkinson 1945), but since then Dr. William Evans has produced weighty evidence that phonocardiography can serve well in distinguishing them. He shows that the *systolic* murmur of mitral stenosis begins earlier on the phonocardiogram than do most other systolic murmurs, so early indeed that, like the presystolic murmur, it must be produced by auricular systole. In support, a mid-diastolic murmur appears on these records (Evans 1947). In his view the term mitral stenosis should cover all rheumatic mitral lesions, and so mitral incompetence finds no place in the index of his recent book (Evans 1948). His fear is that reinstatement of mitral incompetence as a clinical diagnosis would encourage its guilty application to healthy people who happen to have an innocent mitral murmur.

Admittedly, mitral incompetence (or regurgitation) without stenosis is a rarity in adults, though convincing cases have been reported and quoted (Parkinson 1945). In rheumatic children, however, mitral incompetence can scarcely be called a rarity if we rely on pathological

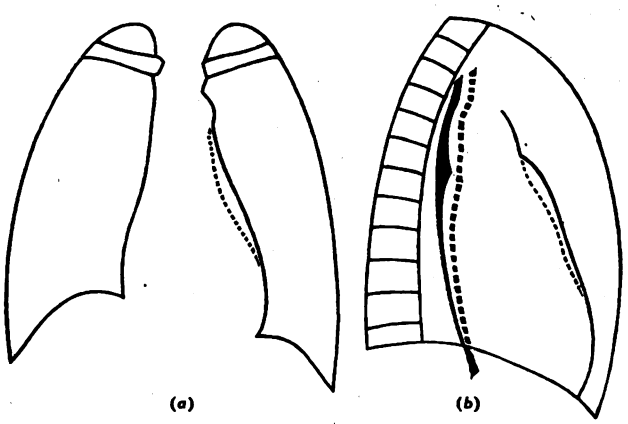

Fig. 8—Early mitral stenosis: (a) anterior view showing straightening of left cardiac border; (b) right oblique view (with barium in œsophagus) showing slight enlargement of left auricle and slight prominence of pulmonary artery. Dotted line represents normal outline.

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evidence. Coombs (1924) held that "mitral regurgitation is a prominent feature of certain phases of cardiac rheumatism, mitral stenosis of certain other phases." Such phases are recorded and contrasted by Bland et al. (1935) in their post-mortem series of 100 rheumatic hearts of patients aged up to 21, average age at death 13. There were 25 with mitral deformity but without anatomical stenosis. They say: "Although considerable deformity may develop during the second year"—i.e., from the onset of rheumatic fever—"scarring of sufficient extent to produce stenosis at the mitral orifice is rarely present before the third year."

In addition to pathological evidence there is the fact that rheumatic children with a loud apical systolic murmur, if followed for several years, are far more likely to show established mitral valvular disease than those with a slight and soft murmur (Boone and Levine 1938, Kuttner and Markowitz 1948). Indeed, Kuttner and Markowitz justify the diagnosis of mitral regurgitation in children on these grounds, even in the absence of demonstrable enlargement. My own preference is to use the term "mitral valvular disease" in such cases, not knowing when stenosis begins in the affected valve.

My purpose in touching upon this debated subject today is to suggest that radiology, and especially electrokymography, may help in the future to bring these pathological mitral-incompetence cases in children into clinical being and to facilitate their recognition during life, thus establishing another distinction between a loud incidental (or innocent) murmur and that of mitral valvular disease.

Radiology.—If an obvious and constant apical systolic murmur exists in a rheumatic subject, and no evidence (even phonocardiographic) of mitral stenosis can be found, we may seek for radiological evidence that there is pure and endocarditic mitral incompetence. There should be some enlargement of the left ventricle and of the left auricle, but the essential feature should be an unusual and abnormal expansion of the left auricle while the left ventricle contracts. To quote Schwedel (1946):

> "Rarely, in mitral insufficiency, when there is marked reflux of blood from the left ventricle into the left auricle, the contour of the latter may expand in systole, and the intrinsic auricular pulsations are overshadowed by the more forcible systolic expansion due to the reflux of blood from the left ventricle."

It is noteworthy that of the two cases he quotes and pictures (his figs. 86 and 228), one had, and the other probably had, mitral stenosis as well as incompetence. Other workers (Hirsch and Gubner 1936, Gubner et al. 1939, Routier et al. 1942) provide convincing kymographic evidence of mitral incompetence, but seldom if ever without the likelihood of associated stenosis. Such an occasional patient might even bear the unfashionable diagnosis of mitral stenosis and incompetence. Especially we wish to see the case with kymographic records of mitral incompetence where necropsy later shows valvular deformity without stenosis; and we are more likely to do so when rheumatic children are investigated in this way. It may be that the new electrokymograph (Henny et al. 1947, Boone et al. 1947) directed on the left auricle, in an oblique position, or anteriorly if the left auricle protrudes to right or left (or both), will best provide evidence of a free incompetence of the mitral valve—regurgitation of blood into the left auricle through a valve which is not stenosed.

MITRAL STENOSIS

Mitral stenosis being the commonest of all valvular lesions due to rheumatic fever, it is fortunate that it provides the best example of the value of radiology in heart disease. The change in shape of the cardiac contour is so early, and at any stage so characteristic, that radioscopy rivals the well-known auscultatory signs. It permits actually a close insight into the progress of the disease from its beginnings to final failure, proving a constant standby and auxiliary in differential diagnosis, in prognosis, and in visualising the effects of treatment.

Enlargement of the left auricle above the stenosis is the cardinal feature. It is so well known that I draw attention only to certain precautions to be taken in using it for early diagnosis. In many children, and in people with a heart well developed by athletics or with a high diaphragm from build or bulk, the curve of the left auricle in the right oblique position may be fairly pronounced in the form of a gentle curve scarcely straightened by a deep inspiration. We can only acquire good judgment of any departure from normal by constantly looking at normal subjects for comparison; and even practice does not make perfect, for there are borderline cases where no arbitrary standards can apply.

Taking the early case, we might proceed in radioscopy as follows:

Barium sulphate, with a little cocoa or chocolate, should be mixed with water till it is a thickish cream but not a stodgy paste. Turn the patient well into the right oblique position, get him to swallow a dessertspoonful of the barium cream, and then watch it go down. If it *changes its course* rather suddenly at the upper end of the left auricle by turning backwards—i.e., dorsad—and then continues as a curve more convex than the normal, such a finding favours the diagnosis of mitral stenosis, especially if the heart as a whole is not enlarged. Turn the patient to and fro in the oblique position until the displacement of the barium is best seen whatever the angle, though one of 45–60° is generally satisfactory. Rest the eyes—and the X-ray tube—for a few moments, then take another look, because the barium may now have moulded itself better and in a finer line to the back of the heart.

Having reached a provisional opinion, turn the patient round into the left oblique position as a routine check. A similar curve in the opposite direction will be seen confirming or modifying the opinion drawn from the right oblique position. Evans (1948) has called this the comma curve and says that, though it is present in healthy adults, it is never absent in mitral stenosis. He believes that in this position a barium line straight down (plumb-line) excludes mitral stenosis.

These procedures for deciding the presence or absence of left auricular enlargement will often still leave room for doubt. Besides, there are conditions other than mitral stenosis which displace the œsophagus backwards (Babey 1937). The left auricle may be enlarged in the presence of a patent ductus (Donovan et al. 1943), or when it participates in general cardiac enlargement or failure; and a pericardial effusion will also push back the œsophagus. An unfolded aortic arch sometimes draws the œsophagus to the left and backwards, but this displacement occurs at a higher level in the chest than the displacement due to an enlarged left auricle.

A suspicion of early mitral stenosis may arise from looking at the ordinary *anterior* view and noticing a well-

LEGENDS TO ILLUSTRATIONS ON PLATE

SIR JOHN PARKINSON

Fig. 3—Calcified aortic valve: man aged 53. Teleradiogram: right oblique position, 20°. Irregular calcified deposit near centre of heart shadow, previously seen in typical motion.

Fig. 4—Calcified mitral valve: woman aged 44. Teleradiogram: anterior view. Rounded calcified deposit near centre of heart shadow, previously seen in typical motion.

Fig. 5—Aortic stenosis: man aged 23, rheumatic history. Teleradiogram: anterior view. Enlargement of left ventricle; slight prominence of ascending aorta; small aortic knob.

Fig. 6—Aortic stenosis: man aged 20, rheumatic history. Teleradiogram: anterior view. Great enlargement of left ventricle; narrow vascular pedicle.

Fig. 9—Early mitral stenosis: man aged 19. Teleradiogram: anterior view. Straightening of left cardiac border.

Fig. 10—Mitral stenosis: man aged 24. Teleradiogram: anterior view Dense left auricle behind upper half of cardiac shadow extending to right border and also to left border (hitherto called conus).

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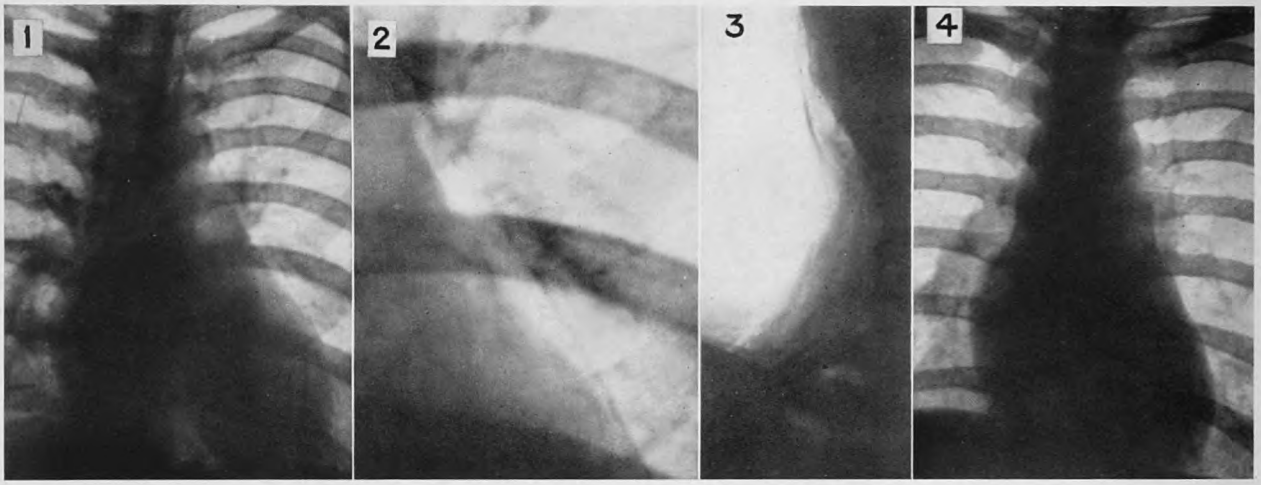
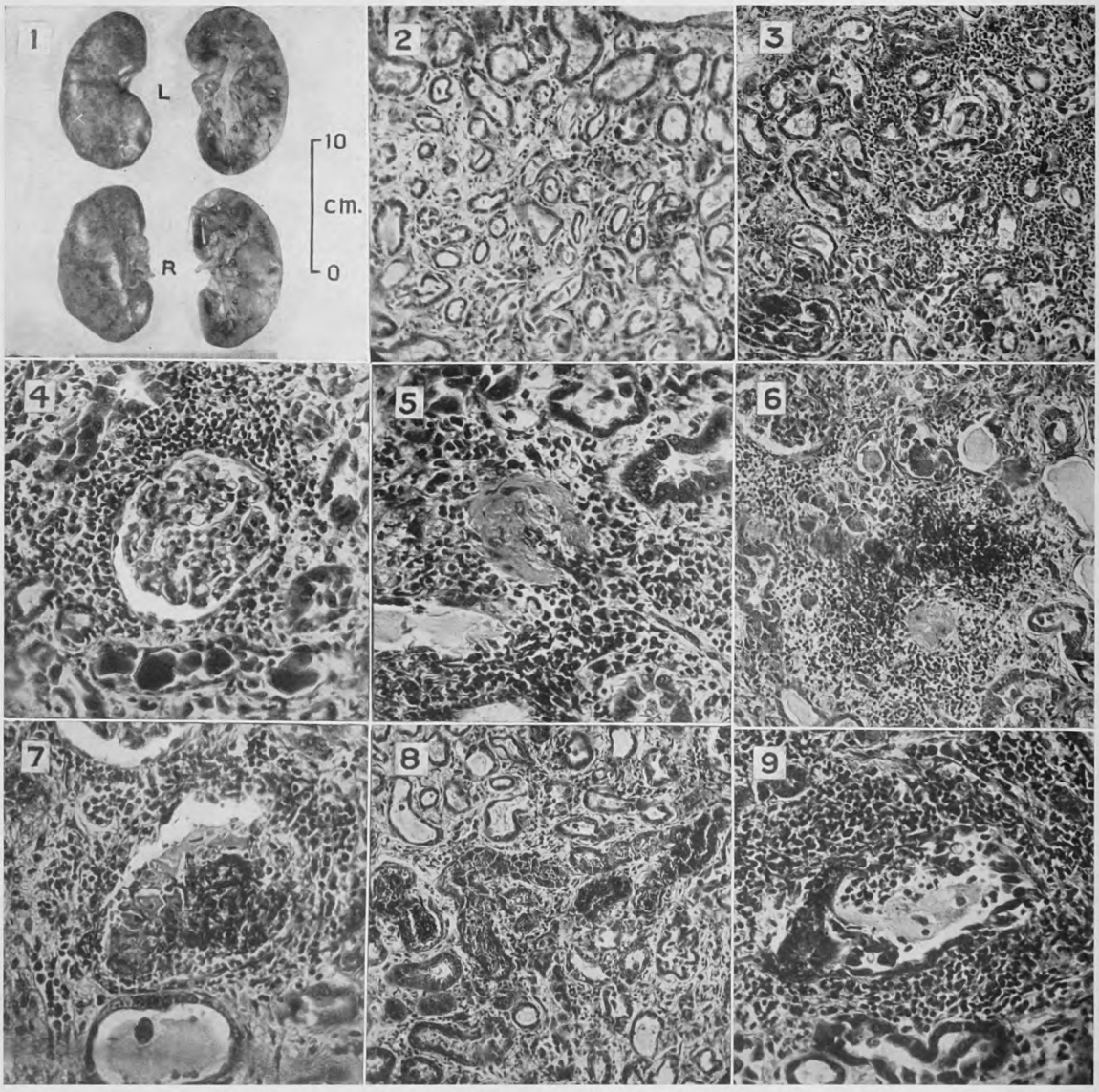
MR. MACRAE : SPONTANEOUS PNEUMOMEDIASTINUM



DR. WEETCH AND OTHERS : FATAL HUMAN CASE OF CANICOLA FEVER



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set-up heart with some widening of its waist-line due to prominence of the contour in the portion between the pulmonary artery (the hilum) and the left ventricle (figs. 8 and 9). This brings me to a confession. I have thought and taught that this prominence, so pronounced in developed mitral stenosis and then most characteristic of it, is the conus of the right ventricle. Now it is the unanimous opinion of workers in angiocardiography (Robb and Steinberg 1939, Grishman et al. 1944) that the conus never constitutes this prominence but always lies well within the cardiac contour, taking no part in its formation. There are minor difficulties in accepting this newer teaching, and exceptions may be found in the future, but it does seem certain that this "conus" prominence of mitral stenosis is no other than the left auricle (atrium) and its appendage. In a sense it simplifies and unifies all three radiological features of mitral stenosis when they are all due to the enlarged left auricle (atrium):

1. The left auricular enlargement seen best in the right oblique position.

2. The prominence seen below the pulmonary artery in the anterior position, hitherto called the "conus."

3. The prominence on the right border at the upper part of the right auricle, seen also in the anterior position (fig. 10).

A further point has been made by angiocardiography. Even in the left oblique position the enlargement to the right ascribed to right ventricular enlargement may prove to be "primarily due to the dilated left atrium" (Sussman and Grishman 1947).

Personally I dislike the hybrid term "pulmonary conus." The pulmonary artery (with its branches) we know and see, and the conus (of the right ventricle and pertaining to it) we know and see by angiocardiography; so why mix or combine the terms?

COMBINED VALVULAR LESIONS

The combination of aortic incompetence and mitral stenosis is commoner than mitral stenosis alone at necropsy (Parkinson and Hartley 1946), but it is far less commonly diagnosed in life. We shall correct this clinical shortcoming if here we acquire the habit of dissatisfaction with a partial diagnosis. The good old clinical rule of unifying a diagnosis still applies, for causal unity is maintained by both lesions being rheumatic. Thus we shall expect to find X-ray evidence of both in most patients with the fully developed disease. Applying the same criteria as for the early radiological recognition of each lesion, we shall often succeed in finding, even at an early stage, evidence of a combined valvular disease. The heart is larger as a whole; in fact it may assume the form which is best termed *general* cardiac enlargement, for the left as well as the right side of the heart is involved. Other examples of general enlargement include long-continued rheumatic carditis in children and severe anæmia in adults (Hunter 1946), in both of which the whole heart is being damaged and deranged. Enough has been said about pure aortic stenosis; and we need not emphasise that aortic stenosis with or without incompetence may accompany mitral stenosis. When we speak of aortic stenosis without incompetence we refer only to the auscultatory signs, for phonocardiography has proved that some incompetence almost invariably accompanies stenosis (Evans 1947). Time and inclination prevent me from dealing with that other and difficult combined valvular lesion—tricuspid stenosis or incompetence (or both), which is never without mitral stenosis, often with aortic stenosis, and sometimes with aortic incompetence.

DIFFERENTIAL DIAGNOSIS

You will agree that the difference in contour between that caused by mitral stenosis and that caused by aortic valvular disease is so great that by X rays we can pick them out easily and recognise each when they are combined.

Every now and then one meets a patient whose history, systolic murmur, and course suggest chronic mitral disease, but we are nonplussed by failure to find an expected presystolic or mid-diastolic murmur to complete that diagnosis. X rays may then reveal in a flash the picture of *atrial septal defect*, one of the commonest of congenital lesions (Bedford et al. 1941). Its pattern is impressive; the heart is enlarged, but the pulmonary artery and its main branches are relatively larger still, sometimes being enormous. Strangely enough mitral stenosis is often combined with it (and specific mitral murmurs may be heard), giving that outstanding example of congenital with rheumatic heart disease. As the left auricle communicates directly with the right, the characteristic left auricular enlargement of mitral stenosis alone may not be so manifest. Radiology may be of great service in distinguishing between rheumatic and syphilitic aortic incompetence, though the left ventricle is large in both. Radiological as well as clinical evidence of accompanying and tell-tale mitral stenosis will be sought. On the other hand, any general or localised aneurysmal change in the aorta will indicate syphilis, though some dynamic dilatation, with pulsation of the ascending aorta, accompanies free aortic incompetence both rheumatic and syphilitic.

HEART FAILURE

In conclusion, I would only mention the scope of radiology in watching the progress of heart-failure. The radiological specialty of rheumatic heart disease is the presence of hilar and pulmonary congestion in developed mitral stenosis without clinical failure. It therefore requires a demonstrable increase in such congestion to indicate radiologically that failure has come. In the detection of a small hydrothorax, or the identification of a pulmonary infarct, X rays can be of service. When clinical indications of recovery from heart-failure result from treatment, it is gratifying to observe and confirm by radiography the disappearance of the signs of failure from the chest.

For advice in adapting this lecture for publication I wish to thank my friend Dr. John Grimshaw, of Birkenhead; and I am grateful to my secretary Miss Mickleburgh for her invaluable help. The diagrams illustrating the radiological anatomy of the normal heart were composed with the help of Dr. Frederic S. Jackson and drawn by an artist friend, Mr. John

LEGENDS TO ILLUSTRATIONS ON PLATE

MR. MACRAE

Fig. 1—Air along left border of heart and extending up left side of origins of great vessels.

Fig. 2—Air in mediastinum between parietal pleura and pericardium.

Fig. 3—Air in fascial planes of neck.

Fig. 4—Complete disappearance of mediastinal air five days later, (compare fig. 1).

DR. WEETCH AND OTHERS

Fig. 1—Kidneys showing mottled subcapsular hæmorrhages.

Fig. 2—Atrophic tubules separated by long-standing fibrosis. (× 80.)

Fig. 3—Diffuse cellular infiltration between tubules, some of which contain hyaline material. (× 80.)

Fig. 4—Intense cellular infiltration round a normal glomerulus. The tubule contains hyaline material. (× 180.)

Fig. 5—Hyalinised glomerulus, surrounded by interstitial cellular infiltration. (× 180.)

Fig. 6—Interstitial hæmorrhage into an area of cellular infiltration. Adjacent to the hæmorrhage is a hyalinised glomerulus. (× 80.)

Fig. 7—Glomerulus showing acute glomerulitis. (× 180.)

Fig. 8—Tubules containing red cells. (× 80.)

Fig. 9—Rupture of wall of tubule by interstitial cellular infiltration. Tubule contains some of these cells and hyaline material. (× 180.)

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Grundy, under correction of my colleagues Dr. D. Evan Bedford and Dr. William Evans.

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"... Of the hazards to life that mankind is now constantly combating with better equipment and with greater success than ever before, heart disease and cancer offer a significant comparison. . . . Degenerative diseases of the heart are accepted almost as a badge of merit. They are considered to be the penalty of industrious application to one's duty and the discharging of a personal debt to society, with interest. Like ulcer, they represent a wound stripe of modern civilization. Cancer, ominous and mysterious, inspires a terror that the conception of heart disease seems to lack. It still implies a portentous degree of finality, as if the knell were already struck, the tolling of the bell begun. . . . The medical profession itself, with the label of 'malignancy' that it has applied to cancer, has helped to emphasize the horror associated with it."—Leading article, *New Engl. J. Med.* April 21, p. 663.

SPONTANEOUS PNEUMOMEDIASTINUM IN PREGNANCY

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With illustrations on plate

AIR in the mediastinum may be unsuspected and may be discovered only on radiography of the chest, or its presence may be suggested by emphysema of the subcutaneous tissues of the thorax or neck.

Spontaneous pneumomediastinum sometimes occurs with injury to the chest wall, or is caused by an increase in the intrapulmonary pressure by forceful coughing with a closed glottis in conditions such as laryngitis and asthma and after heavy lifting.

Rigler (1925) reported the appearance of pneumomediastinum after a normal delivery in a woman with apparently healthy lungs, and the present report is concerned with a similar case. In Rigler's patient there were no symptoms due to the condition. Tympany, which did not shift with position, was present over the whole precordial area, and over the base of the heart were heard clicking râles synchronous with the heart impulse and increased on inspiration; there was no change in the heart sounds. Emphysema of the cervical tissues was present, and Rigler regarded this as the most important diagnostic finding, because it occurs constantly in association with gas in the mediastinal tissues. In his patient the cardiac tympany and the emphysema disappeared completely in four days.

In the present case the patient developed pneumomediastinum during labour.

A primigravida, aged 29, had had scarlet fever at the age of 18, sinus trouble each year for past few years, and an occasional cough this winter. Pregnancy was normal, and labour began a week before term, with the patient in good health; temperature 96°F, pulse-rate 68, blood-pressure 118/76. Heart and lungs normal. Nothing abnormal in the urine. The presentation was left occipito-anterior, the fœtal head being low in the pelvis.

On admission the cervix was fully dilated and the membranes ruptured; the fœtal heart was heard, and the patient was having good pains. Gas-and-air analgesia was started and used till the end of labour 2 hr. 15 min. later. During this time the patient held the anæsthetic mask as firmly as she could to her face and was pushing very hard while holding her breath, and she recollects that it seemed to hurt the sides of her neck and face during these efforts. Half an hour after labour it was noticed that her face was swollen and her lower eyelids puffy, partly closing her eyes. There was no soreness in the chest. The condition became more pronounced and was accompanied by a feeling of distension and discomfort in the face; and in the evening, twelve hours later, there was some pain in the chest with respiration, which made the patient take short frequent breaths, a condition which lasted all night.

Next day there was no panting, but it hurt the patient to breathe deeply, and she still had to take short shallow breaths, and felt better lying flat in bed. Examination at this stage revealed a swollen face with puffiness of the lower eyelids, and crepitus was felt all over the face below the zygoma on each side; crepitus was also present anteriorly and on both sides of the neck and over the whole of the front of the chest and both deltoid muscles. She felt a continuous ache all over these areas, it hurt her to eat or breathe, and she could not take a deep breath. There was no cyanosis, the pulse-rate was 96, and auscultation and percussion of the heart and lungs showed nothing abnormal.

The crepitus gradually cleared, and the rotundity of the face disappeared, showing the patient to have a long thin face; and by the end of five days the emphysema had entirely disappeared and the patient was free from complaint.

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SPONTANEOUS INTERSTITIAL EMPHYSEMA OF LUNGS

Hamman (1937) described six cases of spontaneous interstitial emphysema of the lungs, from which he concluded that not infrequently pulmonary alveoli rupture and allow air to escape into the interstitial tissues of the lungs; if the amount of air is small it causes only localised pain, or perhaps no symptoms at all. This condition, he thinks, may explain some of the many transient pains in the chest of which patients complain and for which no cause can be found. He further states that if a large amount of air escapes it may travel along the interstitial bands to the pleura and there form a vesicle, which may rupture into the pleural cavity to cause a pneumothorax; or the air may spread to the hilum and escape into the mediastinal tissues between the heart and the anterior chest wall, and extend into the subcutaneous tissues of the neck. With this larger escape of air there may be a peculiar crunching crackling sound, heard in various positions over the heart with each contraction, and associated with a cardiac dullness which is diminished or superseded by a tympanitic percussion note. Hamman, however, cites Hoffman as finding crackling râles over the heart with systole as an infrequent sign of air in the mediastinal tissues. Spontaneous interstitial emphysema of the lungs is, Hamman concludes, a benign affair, and the patient can resume his activities without danger.

DIFFERENTIAL DIAGNOSIS

Pneumopericardium

Saupe (1920-21) emphasised the possibility of confusing pneumopericardium with a collection of air between the pericardium and the parietal pleura.

Rösler (1918) said that, since the first authentic case of pneumopericardium was described by Bricheteau in 1844, 74 further cases had been described. Most of these were associated with pericardial fluid of some kind, or have resulted from trauma from within or without (Graebner 1939). Brailsford (1930) regarded pneumopericardium as exceedingly rare: in a thorough review of the literature he found only 4 cases.

Spontaneous pneumopericardium has been found in association with various conditions, such as apparently arrested tuberculosis (Trimble et al. 1942), thoracotomy for empyema (Ghimus and Popesco 1932), perforation of a right subdiaphragmatic abscess (Yellen 1939), the muscular effort of lifting bales of hay (Gilbert 1938), and as a complication of pneumothorax therapy (Wegemer 1938).

Rigler (1925) stated that the symptoms of pneumopericardium are not characteristic. There may, or may not, be dyspnœa or precordial pain; cyanosis is seen only if a massive amount of gas escapes; bradycardia has been described by Hamman (1937); Ljungdahl (quoted by Brailsford 1930) gave the history of a boy aged 18 who, while running, suddenly experienced a severe pain in the chest, with breathlessness and a feeling of obstruction in the bronchi, followed by a loss of strength.

The physical signs of pneumopericardium, on the other hand, Rigler states, are almost unmistakable. Over the cardiac area there is tympany which shifts with change of position; when the patient stands upright, for instance, there is dullness over the lower part of the cardiac area and tympany above. Auscultation reveals splashing gurgling churning sounds, known as *bruit de moulin*, synchronous with the heart beats, and perhaps sometimes a metallic tinkle or rub, and the tinkle may be produced by shaking the patient. In Gilbert's (1938) case the pneumopericardium, caused by the strain of lifting bales of hay, was so extensive that it caused noises in the chest which were the subject of discussion at the patient's family table and were heard by bystanders. Graebner (1939) described 2 cases which occurred in association with acute obstructive laryngitis, and he considered that pneumopericardium may occur at any time during the course of acute obstructive laryngitis. Repeated radiography may reveal this hitherto unsuspected complication, and (he added) cases have been encountered during the course of a routine examination. The precordial air of a pneumopericardium is, however, slowly absorbed (Beverly 1939), and the condition should be looked on as serious.

The similarity between the X-ray appearance of pneumomediastinum when air is present between the pericardium and the parietal pleura and that of pneumopericardium has been commented on. A point of radiological differentiation is that the air shadow of pneumomediastinum continues up past the level of the pericardial sac and along the origins of the great vessels and the aortic knuckle. The fact that it is on the left side that the pericardium is more often seen on radiography to be raised in pneumopericardium (Brailsford 1930, Wenckebach 1910) may, however, cause further difficulty in diagnosis. Clinically, the benign nature of pneumomediastinum, with frequent absence of symptoms, and the fact that the air is reabsorbed in a few days should differentiate the two conditions.

Other Conditions

Hamman (1937) asserted that it is possible for coronary occlusion or pericarditis to stimulate pneumomediastinum, but pneumomediastinum does not show the shock or constitutional symptoms usual in these other conditions.

PRODUCTION OF INTERSTITIAL EMPHYSEMA

Interstitial emphysema is very easy to produce experimentally (Hamman 1937) by raising the intrapulmonary pressure on inflating the lungs with a pump, and in these circumstances air reaches the mediastinum along the bronchi or blood-vessels and soon appears in the subcutaneous tissues of the neck, and concomitantly pneumothorax is also often produced.

Air bullæ have not infrequently been seen on the lung surface in stillborn babes in whom attempts at resuscitation have been made by mouth-to-mouth breathing. It can also be shown that air injected into the lungs from a syringe, without much force, raises coalescing air pockets under the visceral pleura. It is indeed interesting to observe how easily the visceral pleura lifts off the lung surface by this means, whereas it is most difficult to strip it off with dissecting forceps. Likewise, air inserted between the bronchi and the parietal pleura may be seen readily to appear in the mediastinum and the neck. It is also instructive to demonstrate, with a needle carrying air under pressure, the separation by the air of the parietal pleura from the pericardium; the space between them has to be aerated separately on each side of the heart and an air sac forms which persists along the side of the heart and origins of the great vessels on the one hand and the parietal pleura on the other and limited anteriorly by a firm attachment of the parietal pleura to the pericardium.

It can be understood from the above-mentioned experiments how Hamman wished to emphasise that interstitial emphysema of the lungs often occurs spontaneously without trauma or any unusual distension of the lungs and when the person affected is walking quietly or resting.

SUMMARY

A case of spontaneous pneumomediastinum occurring during the strain of labour is described.

Rupture of the lung caused air to dissect off the visceral pleura, to extend along the bronchi and blood-vessels to the mediastinum and fascial planes of the neck, and to form a pocket between the parietal pleura and the pericardium.

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The differential diagnosis is chiefly from pneumopericardium; the distinguishing feature is that in pneumomediastinum the air extends above the level of the pericardial sac.

The absence of untoward symptoms, the presence of air in the subcutaneous tissues of the neck, and its early absorption point to pneumomediastinum.

ADDENDUM

Another case has been seen while this article was going to press. The patient—admitted under the care of Mr. Briant Evans—developed a pneumomediastinum with surgical emphysema of face and neck and upper part of thorax anteriorly, during the second stage of labour when she was bearing down with great force. The outline of the surgical emphysema was best delineated by listening to the air being displaced by the pressure of the stethoscope. Chest radiography showed striate aeration along the left border of the heart, suggesting that the air between the parietal pleura and the pericardium was less than in the case reported above. The symptoms and signs were otherwise similar to those described, and after 36 hours the condition was disappearing.

I wish to thank Mr. W. R. Winterton for permission to publish this case.

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ACUTE MEDIASTINAL AND SUBCUTANEOUS EMPHYSEMA

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ACUTE mediastinal and subcutaneous emphysema is generally regarded as a rarity. The mechanism producing it has been studied experimentally in the U.S.A., and a few cases have been described, but scant attention has been paid to it in this country. The following severe case illustrates certain manifestations which can confuse the clinical picture, especially before the escaped air in the mediastinum becomes subcutaneous.

CASE-RECORD

A woman, aged 29, was admitted to hospital at 10 P.M. on Feb. 20, 1949, during an attack of bronchial asthma of twenty-four hours' duration. She was a primipara eight months pregnant and gave a history of a single attack of asthma some years previously.

On admission she was very distressed. Her dominating symptom was dyspnœa. She was cyanosed and complained of a sense of oppression over her chest and neck. Her face, neck, and supraclavicular fossæ appeared swollen, and her right eye was closed. Superficially she resembled a case of angioneurotic œdema. On palpation crepitus was elicited over the swollen parts. This subcutaneous emphysema extended from the zygomata above, over the parotid glands, to the root of the neck. The crepitus was elicited over the chest wall, along the flanks, and down to the upper part of the thigh at a level corresponding to Holden's line. It was present in the axillæ, down the arms and forearms, to the wrists (fig. 1).

The pulse-rate was 160, temperature 100·6°F, and blood-pressure 190/120. The patient was in a typical asthmatic attack. Auscultation of the chest revealed a peculiar crunching noise as the air was squeezed along the fascial planes by the pressure of the stethoscope. Underlying this was the usual assortment of adventitious sounds in both lung fields. With the stethoscope firmly pressed over the apex of the heart a similar noise was audible—a distinct crunch, crunch, crunch, synchronous with each heart beat.

Treatment.—The patient was placed in an oxygen tent, and adrenaline min. 15 was administered subcutaneously at the usual rate of 1 minim a minute. Atropine gr. $^1/_{100}$ was also given. This treatment had no effect. The patient's respirations became gasping and infrequent, her cyanosis deepened, and she became comatose and pulseless. At this stage adrenaline (1 in 1000) minims 45 was rapidly administered subcutaneously with immediate effect. Penicillin therapy was instituted in view of her pyrexia.

A further attack of status asthmaticus began next morning, and the patient quickly assumed the alarming state described above. The subcutaneous emphysema increased to such a point of tenseness round the neck that small incisions were contemplated to relieve the pressure. However, the spasm was soon overcome with a single dose of adrenaline minims 45.

Progress.—From then onwards the patient made an uninterrupted recovery, and within forty-eight hours her blood-pressure was 120/80, temperature 98·6°F, and respirations 20 per min. The subcutaneous emphysema was still present, though reduced in amount, and the systolic crunching sounds over the cardiac apex were still audible. The patient was conscious of a grating sensation over her precordium when lying quite still on her left side. On the third day this sign had disappeared.

She was transferred to an obstetric unit on the eighth day, where she was delivered of a stillborn child. The emphysema had disappeared completely by the twelfth day, and she is now quite well.

ÆTIOLOGY AND MECHANISM

Acute mediastinal and subcutaneous emphysema may follow any sudden, violent, and prolonged expiration—e.g., after aspiration of a foreign body, in bronchial asthma, and in straining during labour. In some people an inherent defect of the alveoli may predispose to spontaneous attacks. The condition may be associated with a spontaneous pneumothorax. Macklin (1939), by overinflating the lungs of cats, has demonstrated the mechanisms concerned. After sudden overdistension of the pulmonary alveoli air escapes through a rent in the lung parenchyma to cause a localised interstitial emphysema. If the intra-alveolar pressure is maintained, further air escapes into the interstitial lung tissue and tracks along the sheaths of the pulmonary vessels into the mediastinum. The air is usually forced from the

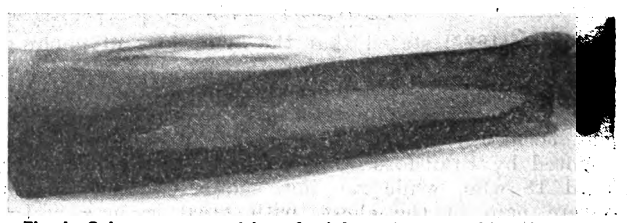

Fig. 1—Subcutaneous and interfascial emphysema of left forearm.

periphery of the lung towards the mediastinum, but sometimes it passes towards the visceral pleura, producing subpleural bullæ and pneumothorax. Macklin, however, maintains that by far the most common method of production of a pneumothorax is a secondary rupture of the mediastinal surface of the parietal pleura by the increased mediastinal pressure.

This view is upheld by Hamman (1939) and others though it is contrary to the accepted teaching about the method of formation of spontaneous pneumothorax in healthy people. In this way contralateral pneumothorax, in which injury to one lung is followed by a pneumothorax on the opposite side, is easy to explain; since, once air has entered the mediastinum, it is pure chance whether the right or the left parietal pleura is pierced.

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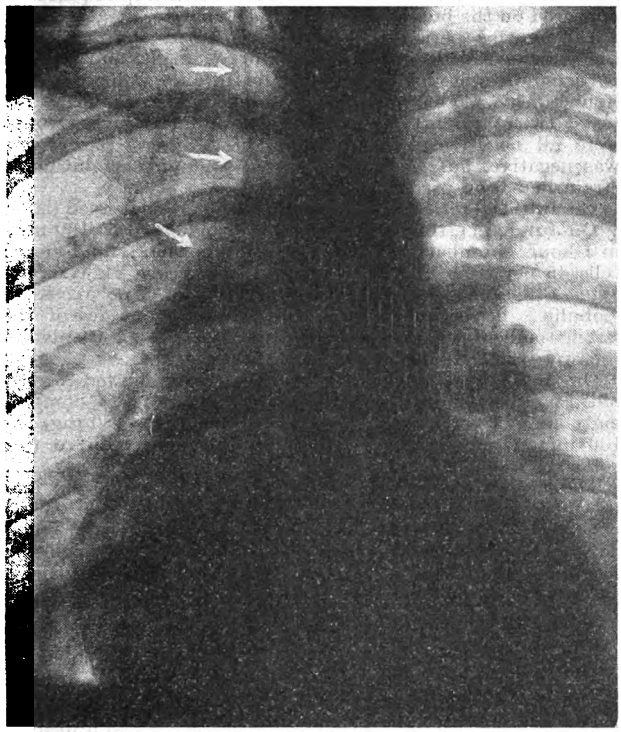

Fig. 2—Radiological evidence of mediastinal emphysema: thin radio-opaque lines parallel to vertebral column in line with tips of transverse processes and with narrow translucent area between them and root shadow.

The pretracheal and prevertebral fasciæ are continuous at their lower ends with the anterior and posterior walls of the mediastinum respectively. The air originally is enclosed within these two layers. With increasing pressure it escapes through the loose connective tissue surrounding the great vessels, particularly the veins, into the posterior triangles of the neck and Burns's space. The air is now beneath the general investing layer of deep cervical fascia and enters the subcutaneous space via the numerous venous stomata. The sheaths of the axillary vessels may also provide an exit from the thorax into the arms. A further outlet is through the aortic hiatus into the retroperitoneal space. This sequence may occasionally be reversed, as when mediastinal emphysema follows neck wounds or retroperitoneal perforations. Welty (1949) suggests, in a case he describes of intraperitoneal perforation with mediastinal emphysema, that the air enters the subserous coat at the site of perforation and tracks along the perivascular sheaths of the mesenteric vessels to the aorta, and thence through the aortic hiatus into the mediastinum.

SYMPTOMS, SIGNS, AND DIAGNOSIS

The pressure of air under tension in the mediastinum gives rise to severe substernal pain, which radiates sometimes to the left arm. The pain is often associated with respiration, moving the head, swallowing, &c., and may be confused with the pain of coronary thrombosis or other intrathoracic lesions. In some cases pain is not prominent, as in our case and in that described by Adcock (1943); this is due to the relief of tension by air escaping between the fascial planes into the neck. Sudden improvement in the pain as soon as subcutaneous emphysema appears was noted by Torrey and Grosh (1919).

The first description of the peculiar crunching sound over the precordium is credited to Muller (McGuire and Bean 1939). However, its full significance was recognised by Hamman (1937). It is due to the heart contracting against collections of air lying between the parietal pericardium and parietal pleura, or within the mediastinal tissues.

Diagnosis offers no difficulty in those cases where the air appears subcutaneously; for, apart from direct trauma to the lungs—e.g., fractured ribs—air can only become subcutaneous by travelling via the hilum and mediastinum through the upper thoracic inlet and perivascular sheaths of large vessels. It is on cases of purely mediastinal emphysema that attention should be focused, particularly the spontaneous variety; for, if Macklin's conclusions are correct, it should be at least as frequent and well-recognised a clinical entity as spontaneous idiopathic pneumothorax. But this not being so suggests that many cases of mediastinal emphysema are unrecognised. In cases of obscure chest pain, whether following an abnormal physical effort or not, one should look for Hamman's sign on auscultation of the heart, and for radiological evidence of mediastinal emphysema—i.e., thin radio-opaque lines running parallel to the vertebral column in line with the tips of the transverse processes and with a narrow area of translucency between them and the root shadow (fig. 2), due to air pockets lining the lateral boundaries of the mediastinum.

PROGNOSIS AND TREATMENT

Most cases, including all the spontaneous ones reported, recovered without any special treatment. However, in those (like ours) attributable to a definite cause, prompt treatment is essential. Adrenaline was used cautiously, in view of the pregnancy and high blood-pressure, until it was realised that, as long as even the slightest degree of bronchial spasm remained, air was being pumped into the interstitial tissue and mediastinum. The already impaired vital capacity of the lungs was being severely restricted by the interstitial emphysema. At the same time the pulmonary and systemic veins were being subjected to increasing mediastinal pressure, which imposed an additional burden on the circulation already handicapped by the attack of status asthmaticus and an eight-month pregnancy. It was imperative that this vicious circle should be broken. Before the large dose of adrenaline was given, incisions in the neck were contemplated in view of the increasing tenseness, but these proved unnecessary. Dramatic results have been reported to follow such therapy, the air escaping with alarming force on incision of the deep fascia (Elliot 1938). More recently various methods of exploring the mediastinum have been devised, especially in those cases where air does not escape through the thoracic inlet (Hamman 1945).

Oxygen therapy is an important adjuvant; indeed, it may be life-saving. Penicillin is essential, not only to control the inflammation in the lungs, which contributes to the bronchial spasm, but also to prevent the onset of mediastinitis, since here one is dealing with a direct pathway between a potentially infected bronchial tree and the mediastinum.

SUMMARY

A case of mediastinal and subcutaneous emphysema due to status asthmaticus in pregnancy is described.

The mechanism, symptoms and signs, diagnosis, prognosis, and treatment are discussed.

We wish to thank Dr. A. Morris, the medical superintendent, for his helpful suggestions and interest in the preparation of this paper.

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FATAL HUMAN CASE OF CANICOLA FEVER

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With illustrations on plate

MORE than 100 cases of human infection with *Leptospira canicola* have been recorded since canicola fever was first recognised in man by Dhont et al. (1934). Only 5 cases have been reported so far in England (Baber and Stuart 1946, Laurent et al. 1948), but others are being brought to light as interest in leptospirosis increases. Canicola fever in man generally runs a mild course but is occasionally serious, and a death has been reported by Ruys (1947), though no details have yet been published.* The present fatal case is described in full because death seems to have been determined by pre-existing damage to the kidneys.

A thin pale married woman, aged 35, was admitted to the Royal Infirmary, Sheffield, on July 19, 1948, on the seventh day of illness. Her health had been normal until a week before admission, when occipital headache and nausea had developed, with generalised aches and pains in both loins. Cramp-like pains came on in the calves of her legs, which felt tired and useless. She was drowsy and extremely thirsty. Her urine had been bloodstained, but only during the first two days of illness.

Previous Illnesses

Sixteen years previously the patient had been admitted to hospital during her first pregnancy with hyperpiesis and albuminuria. She had been delivered of a normal child two weeks later, and her condition had been satisfactory during the puerperium. Four further confinements had been conducted safely at home, but the patient had had severe headaches during all her pregnancies.

On Admission

Temperature 101·2°F, pulse-rate 104, and respirations 22 per min. The patient was drowsy but coöperated fairly well and gave a clear history. Her skin was hot and dry, and her tongue dry and thickly coated. No enlarged glands were found, and the jugular venous pressure was not increased. Heart, lungs, optic fundi, and cranial nerves were all normal. Some stiffness of the neck was evident, but Kernig's sign was absent. The tendon-reflexes were obtained but were generally diminished; the plantar response was flexor. The liver was palpable 1 in. below the right costal margin. There was tenderness to deep pressure over both loins. Urine: sp. gr. 1·008; albumin present; a centrifuge deposit contained squamous epithelial cells and a few leucocytes, but neither red blood-cells nor casts; sterile on culture. Blood-count: 3,600,000 red cells per c.mm.; 11,000 white cells per c.mm. (polymorphs 91%, lymphocytes 9%); Hb 72%. Erythrocyte-sedimentation rate (E.S.R.) 30 mm. in 1 hour. Lumbar puncture: initial pressure 170 mm.; Queckenstedt's test normal; fluid slightly turbid; 168 cells per c.mm. (erythrocytes 3, polymorphs 55, lymphocytes 110); total protein 60 mg. per 100 ml.; a slight excess of globulin; chlorides 780 mg. per 100 ml.; glucose 55 mg. per 100 ml.; no organisms; culture sterile. Whole-blood non-protein nitrogen 45 mg. per 100 ml.

Subsequent Course

During the next four days the patient's temperature and pulse-rate fell to normal, but her clinical condition remained unchanged, and drowsiness continued. Oliguria was present. The urine contained albumin; sp. gr. 1·006–1·012.

On July 21 (11th day of illness) bilateral conjunctival injection developed, and local penicillin therapy was instituted. On the forehead, face, and upper chest appeared a pink papular rash, which became vesicular on the forehead during the next two days. At the same time a small crop of petechiæ appeared on the buccal mucosa and soft palate.

During this period the patient remained apyrexial, but there was no evidence of clinical improvement, and oliguria persisted in spite of increased fluid intake. Blood-culture (four times), Wassermann, Paul-Bunnell, and agglutination tests (twice) against the enteric and undulant-fever groups were all negative. Agglutination of *L. icterohæmorrhagiæ* was negative, but later tests showed that an inagglutinable strain had been used.

On July 26 (15th day) vomiting began and continued daily.

On July 28 (17th day) the E.S.R. had increased to 100 mm. in 1 hour. Lumbar puncture: pressure normal; fluid clear; cells 45 per c.mm. (erythrocytes 5, polymorphs 24, lymphocytes 16); total protein 40 mg. per 100 ml.; no excess of globulin; no organisms; culture sterile. In view of the strong clinical suspicion of leptospirosis, general penicillin therapy (120,000 units three-hourly) was begun.

On July 29 (18th day) biochemical tests showed whole-blood non-protein nitrogen 284 mg. per 100 ml.; CO_2-combining power 25 volumes %; and plasma-chlorides 480 mg. per 100 ml. Leptospiral agglutination tests were positive (see below).

The patient was now in a state of uræmia and acidosis, and the fall in the plasma-chloride level was attributable to the persistent vomiting. Intravenous infusions of saline and dextrose were therefore begun, and the plasma-chloride level rose to 520 mg. per 100 ml. next day. The non-protein nitrogen had then fallen to 230 mg. per 100 ml., but the CO_2-combining power remained at 24 volumes %.

Intermittent pyrexia began again on the 19th day; the patient's condition deteriorated progressively and she died of uræmia on the 24th day of disease.

Necropsy

Both kidneys were enlarged. On section the cortex appeared pale, but it was mottled with small hæmorrhages, which were also obvious on the cortical surface when the capsule was stripped off (fig. 1). There was neither granularity nor apparent loss of cortex. The brain showed some surface congestion and a few scattered petechiæ in the white matter of the basal ganglia and cerebrum. There was some pulmonary œdema. The liver, normal in size, showed the characteristic brown colour associated with uræmia. The spleen was congested and slightly diffluent. All other organs appeared normal.

Histology

Only the kidneys showed noteworthy pathological changes. These consisted of interstitial fibrosis associated with œdema and vascular congestion, infiltration with plasma cells and lymphocytes, and focal interstitial hæmorrhages. In localised areas the tubules were atrophied, but the glomeruli showed relatively little change. As a result of the interstitial fibrosis in these patches the tubules were widely separated, and the atrophied ones contrasted markedly with those in less fibrotic areas (fig. 2). By comparison the latter appeared enlarged though they were not obviously hypertrophied, as occurs in chronic glomerulonephritis. In these areas of collapse and fibrosis most of the glomeruli were normal, though a few hyalinised ones could be seen (figs. 5 and 6).

On the whole, the infiltration of plasma cells and lymphocytes was diffuse, between the tubules (fig. 3) and round the glomeruli (fig. 4), but there were focal areas of heavier infiltration both in the cortex and medulla, and in the neighbourhood of the pelvis. It was in these heavily infiltrated sites that interstitial hæmorrhages had occurred (fig. 6).

Some glomeruli showed acute glomerulitis, with red blood-cells in Bowman's capsule. One glomerulus was partly fibrosed, partly thrombosed, and hæmorrhagic (fig. 7). Many tubules contained hyaline casts (figs. 3 and 4), granular debris, desquamated epithelial cells, and red cells (fig. 8). In some areas the tubules were filled with inflammatory cells continuous with the interstitial infiltration which had ruptured the tubular walls (fig. 9).

No leptospiræ were seen in sections stained by Giesma's and Levaditi's methods, but this is usual in fatal cases of Weil's disease and has no diagnostic significance.

BACTERIOLOGICAL INVESTIGATION

(Dr. J. C. BROOM)

Human

A specimen of serum, taken on the 18th day after the onset of symptoms, showed equal positive agglutination

*Prof. Charlotte Ruys and Professor Wolff, of Amsterdam, have generously sent us their notes on this case, which, with Dr. Minkenhof and Dr. Bauer, they expect to publish soon.

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REACTIONS OF UNABSORBED AND ABSORBED SAMPLES OF PATIENT'S SERUM

Titre against	Unabsorbed	After absorption with	
		L. icterohæmorrhagiæ	*L. canicola*
L. icterohæmorrhagiæ ..	1/1000	0	0
L. canicola	1/1000	1/300	0

0, negative in serum dilution of 1/20.

titres against *L. canicola* and *L. icterohæmorrhagiæ* (see table).

It is usual, but not invariable, for the serum from a case of leptospirosis to produce some degree of para-agglutination, but in most instances the titre is much higher for the homologous organism. Occasionally the titres are the same for both species, and the diagnosis must then be completed by cross-absorption tests. Confirmation of this result can be obtained by testing samples at intervals during the course of the disease, because the homologous titre rises, whereas the heterologous falls. The death of this patient made it impossible to follow the changes in antibody levels, and only a cross-absorption test could be carried out. The result, also shown in the table, clearly indicates that the infecting organism is *L. canicola*.

Dog

The patient owned a male smooth-haired mongrel terrier which had never been obviously ill. A specimen of its serum agglutinated *L. canicola* to a titre of 1/300 and showed only insignificant traces of agglutination with *L. icterohæmorrhagiæ*. No leptospiræ were seen in a centrifuge deposit of urine, so the dog was sacrificed. At necropsy there was no gross evidence of disease, but sections of kidney showed scattered areas of fibrosis, which might be the result of localised damage by leptospiræ. No leptospiræ were seen in sections stained by Levaditi's method.

An emulsion of kidney was inoculated into two hamsters (*Cricetus auratus*), one of which was sacrificed on the 6th day. Necropsy showed a small hæmorrhage in the right lung, and a strain of leptospira was isolated in culture from the heart-blood. Agglutination and absorption tests proved the organism to be *L. canicola*. The second hamster died on the 14th day with typical signs of leptospirosis; large numbers of leptospiræ were present in the kidneys.

DISCUSSION

The clinical evidence in this case strongly suggested anicteric leptospirosis. In addition to the triad of aseptic meningitis, conjunctivitis, and albuminuria, muscular pains and a rash were present, and the fever recurred during the third week of illness. The diagnosis in this country then lies between Weil's disease and canicola fever, but the final decision must rest on bacteriological and epidemiological findings, because no purely clinical differentiation is possible. The best proof is the identification of a strain of leptospira isolated from the patient, but in the present instance the need for such confirmation was not appreciated until the complete serological results were available, and by that time the patient had died. The absorption test, however, gave unequivocal results and showed the infecting organism to be *L. canicola*. Further, the patient was in close contact with a dog harbouring *L. canicola* in its kidneys.

When the clinical, bacteriological, and epidemiological findings are taken into consideration, the diagnosis of canicola fever seems fully justified.

Canicola fever in dogs presents typically a severe and often fatal nephritis, and in man, though the disease is generally benign, it sometimes involves the kidneys. Thus the patient described by Bukh (1940) was gravely ill; his blood-urea level rose to 280 mg. per 100 ml., and on two occasions his urinary output fell to 25 ml. a day. His condition was critical for some time, but he survived and completely recovered.

In the present case, however, there were two distinct and separate histological pictures in the kidney: (1) the interstitial fibrosis with tubular atrophy and occasional hyalinised glomeruli, a relic of the lesion present at the time of the first pregnancy sixteen years ago; and (2) superimposed on this, the typical appearances of acute interstitial nephritis as described by Fishberg (1947). The cause of death was uræmia, due to acute interstitial nephritis in an already damaged kidney. It is interesting to note that, in the Dutch case, Wolff (personal communication) found polycystic disease of the kidneys, which he considered to be a contributory cause of death.

SUMMARY

A fatal case of canicola fever (leptospirosis canicolaris) is presented with a description of the clinical, pathological, and bacteriological findings.

The cause of death was uræmia, due to acute interstitial nephritis superimposed on chronic nephritis.

The chronic nephritis evidently dated from the patient's first pregnancy sixteen years earlier.

Penicillin therapy, begun on the 17th day, had no effect on the course of the disease.

The source of infection was apparently the patient's dog, which was a carrier of *L. canicola* though it had never shown signs of illness.

We wish to thank Dr. A. W. D. Leishman, under whose care the patient was admitted, for permission to publish this case and for helpful advice and criticism; Dr. L. C. D. Hermitte, pathologist, Sheffield Royal Infirmary, for the pathological report; and Mr. F. Battersby, of the Sheffield Royal Infirmary photographic department, for the photographs.

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CANICOLA FEVER IN GERMANY

REPORT OF SIX CASES

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WE report here six cases of canicola fever diagnosed in a British military hospital in Germany in the past few months. Only one other case has been notified previously from German sources in Germany, but it seems reasonable to assume that canicola fever is less rare in Germany than was formerly supposed, that its apparent rarity may be due to failure to diagnose cases as they arise, and that in the past this disease was diagnosed variously as jaundice, pneumonia, nephritis, infective gastritis or gastro-enteritis, benign meningitis, or influenza. Such diagnoses are apt to be made with great readiness, especially when cases do not receive the full investigations that they merit and when diagnoses are made on clinical grounds alone.

Vague diagnoses, such as primary atypical pneumonia, in the absence of cold agglutinins in the blood, may hide cases of canicola fever, Q fever, influenza, pneumo-

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typhoid, typhus fever, &c. Another vague diagnosis, benign lymphocytic meningitis, may be used in cases of canicola fever, infectious mononucleosis, non-paralytic anterior poliomyelitis, influenza, relapsing fever, meningo-typhoid, &c. Further, meningitis may be present without Kernig's sign, head-retraction, or neck-rigidity. We feel that cases of pyrexia of unknown origin, with headache, vomiting, and neck-stiffness, however slight, and even without Kernig's sign, should have a lumbar puncture done.

In cases of fever of dubious origin, albuminuria should not necessarily be regarded as being febrile in origin and dismissed as of little significance. Such cases merit a blood-urea estimation and repeated agglutination tests for leptospirosis. In all cases of "nephritis" a possible cause should be exhaustively and persistently sought. Febrile cases with nausea and vomiting may be diagnosed as gastritis, gastro-enteritis, or gastric influenza. In cases of undetermined origin a history of association with dogs should be sought and canicola fever excluded. Canicola fever is a relatively benign disease—recovery is the rule—and so it is easy to see how diagnoses of benign meningitis, nephritis, atypical pneumonia, jaundice, &c., would pass unchallenged.

CASE-RECORDS

Case 1.—A young man, aged 19, was admitted to hospital with five days' history of general malaise, headache, vomiting, abdominal pain, and constipation. It was learnt later that he had bathed in the same semi-stagnant pool as case 2 about two weeks before the onset of symptoms. Past medical and family histories contained no relevant details.

On admission the only abnormal findings were a temperature of 102°F and albuminuria. His pulse-rate was 70 per min. There was a slight polymorph leucocytosis. A centrifuged deposit of the urine contained a few erythrocytes and leucocytes but no casts and was sterile on culture.

The patient's condition remained unchanged until the 9th day of the disease, when neck-stiffness and Kernig's sign were detected. The conjunctivæ were injected. There was no significant alteration in the leucocyte-count. Radiography of the chest revealed no abnormality. The cerebrospinal fluid (C.S.F.) contained 169 cells per ml. (polymorphs 20%, lymphocytes 80%). The protein content of the C.S.F. was 100 mg. per 100 ml. without excess of globulin. On the 12th day the C.S.F. contained 70 cells per c.mm. (polymorphs 12%, lymphocytes 88%) and 35 mg. of protein per 100 ml. On the same day the serum-bilirubin was 0·2 mg. per 100 ml. The blood-urea was 20 mg. per 100 ml. on the 10th day of the illness. Blood-serum collected on the 7th and 13th days of the illness contained significant and rising titres of antibodies to *Leptospira canicola*.

The patient's further progress was uneventful, and he was discharged from hospital on the 26th day of the disease having had symptomatic treatment only.

Case 2.—A man, aged 22, was admitted to hospital on the 9th day of an illness which had begun acutely with headache, vomiting, and diarrhœa, six watery stools being passed in two hours. General malaise, listlessness, excessive perspiration, anorexia, abdominal soreness, and several small epistaxes were noted in the subsequent 8 days. The patient was unfit for duty on the 3rd, 6th, and 7th days of the illness. He had a violent headache on the evening of the 8th day, and was referred to hospital. He described the headache as a continuous dull pain felt chiefly behind the eyes. It was worst in the mornings and was aggravated by coughing, sneezing, and hanging the head down. Severe bouts of headache were associated with vomiting.

The patient had bathed in the same semi-stagnant pool as case 1 about a fortnight before the onset of symptoms. He had had an uncomplicated attack of gonorrhœa in 1946. His past medical and family histories contained no other significant details.

On admission his temperature was 100°F, and pulse-rate 100 per min. Both conjunctivæ were grossly injected, with subconjunctival ecchymoses. The optic discs were hyperæmic. A fine horizontal nystagmus was present on deviation of the eyes to the right. There was a non-paralytic internal strabismus of the right eye, but the patient said he had had a squint since childhood. There were no signs of meningeal irritation. No further abnormal physical signs developed.

The headache began to subside on the 11th day of the disease. Intermittent fever persisted until the 12th day, but all abnormal symptoms and signs disappeared by the 13th day.

A lumbar puncture on the 11th day of the illness produced clear fluid under a pressure of 120 mm.; there was no evidence of subarachnoid block. The C.S.F. contained 120 cells per ml. (polymorphs 20%, lymphocytes 80%); protein 70 mg. and chloride 760 mg. per 100 ml. Globulin was not present in excess. The white blood-cell count on the 10th day was 9400 per c.mm. (polymorphs 62%, lymphocytes 32%, eosinophils 4%, basophils 1%, monocytes 1%), and on the 14th day 10,600 per c.mm. (polymorphs 65%, lymphocytes 32%, basophils 2%, monocytes 1%). The blood-urea was 30 mg. per 100 ml. on the 14th day. All attempts to demonstrate leptospiruria were unsuccessful. Blood-serum collected on the 14th and 15th days of the illness contained significant titres of agglutinins to *L. canicola*.

The man's convalescence was uneventful, and he was discharged from hospital on the 28th day of the illness, having had only symptomatic treatment. Blood-serum collected on the 211th day from the onset of illness agglutinated *L. canicola* to a titre of 1 in 1000 and showed partial agglutination with *L. icterohæmorrhagiæ* to 1 in 30.

Case 3.—A man, aged 34, was admitted to hospital with four days' history of general malaise, headache, myalgia, "feverishness," and excessive nocturnal perspiration. He had been in bed since the 3rd day of the illness. An unproductive cough had developed on the day of admission to hospital. He had served in the middle and far eastern theatres of war and had had malaria in 1933. His past medical and family histories contained no other relevant details.

On admission the predominant symptom was a dull boring pain behind the eyes; this was aggravated by movement of the eyes and by exposure to light. Temperature 101·8°F, pulse-rate 120 per min. Gross conjunctival infection, albuminuria, and muscle tenderness were the only other abnormal physical signs. A polymorph leucocytosis was present in the peripheral blood. No malarial parasites were detected in thick and thin blood films. A radiogram of the chest was normal. Blood-serum collected on the day of admission did not contain a significant titre of antibodies to *L. canicola*.

Headache and myalgia were more severe on the 6th day of the illness, when fever and a polymorph leucocytosis were still present and the blood-urea was 100 mg. per 100 ml. No malarial parasites were found on repeated examination of thick and thin blood films. A centrifuged deposit of urine contained a few erythrocytes and leucocytes but no casts and was sterile on culture. No leptospiræ were detected in fresh warm alkaline specimens of urine at any stage of this man's illness.

The patient's condition was unchanged on the 7th day. No pathogenic organisms were detected by repeated microscopy and culture of the fæces. Fluoroscopy showed normal diaphragmatic mobility. The maxillary sinuses were opaque to X rays, but no pus was found on antrotomy and lavage. The Widal reaction was negative. No significant titre of agglutinins to brucella was detected. The patient's serum agglutinated *Proteus* OX2 at a dilution of 1 in 160, and OX19 at a dilution of 1 in 20, on the 9th day.

Retro-orbital pain, conjunctival injection, and muscle tenderness were worse on the 8th day. Slight resistance to flexion of the cervical spine was detected. Kernig's and Brudzinski's signs were negative. The optic discs were normal. The C.S.F. was under a pressure of 266 mm.; there was no evidence of subarachnoid block. The C.S.F. was opalescent and contained 446 leucocytes per ml. (polymorphs 67%, lymphocytes 33%); protein 80 mg. per 100 ml. with an excess of globulin; chloride 760 mg. per 100 ml.; Wassermann reaction negative. The serum-bilirubin was 0·2 mg. per 100 ml.

The patient was afebrile by the 10th day, and completely free from abnormal symptoms and signs by the 12th day. Blood-serum collected on the 11th and 21st days of the illness contained significant and rising titres of antibodies to *L. canicola*.

Convalescence was uneventful. A Paul-Bunnell reaction on the 23rd day was negative. A polymorph leucocytosis persisted in the peripheral blood after the clinical signs of infection had subsided. The cytology and chemistry of the C.S.F. had assumed their normal pattern, except for a slight excess of globulin, by the 27th day. The patient was dis-

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charged from hospital on the 35th day, having had only symptomatic treatment.

Case 4.—A man, aged 36, was admitted to hospital with four days' history of general malaise, anorexia, nausea, vomiting, and "feverishness." He had had malaria while a prisoner-of-war in the far east, but his past medical and family histories contained no other significant details. The patient's two dogs had had diarrhœa and appeared listless for several weeks before he was admitted to hospital. It was learnt subsequently that both animals had died about three weeks later, having had severe diarrhœa and loss of fur. Canine distemper had been diagnosed.

On admission the only abnormal findings were a temperature of 101°F, albuminuria, and a polymorph leucocytosis in the blood. No malarial parasites were detected in routine thick and thin blood films.

Conjunctival icterus, tenderness in the right hypochondrium, and bilirubinuria were present on the 6th day of the illness. Next day the patient's general condition was worse. He complained of general malaise and severe generalised headache. The jaundice was more intense, and he began to expectorate blood-streaked mucopurulent sputum. Fœtor oris was present. The optic discs were injected. The liver was enlarged and tender, the lower border being palpable two finger-breadths below the right costal margin, and the liver dullness extending upwards to the level of the 7th rib in the right midaxillary line. Bilirubin and albumin were present in the urine, and a centrifuged deposit contained leucocytes and erythrocytes but no casts and was sterile on culture. No leptospiræ were detected in fresh warm alkalinised urine at any stage of the illness. Blood-serum collected on the 7th day of the disease was later shown to contain a significant titre of agglutinins to *L. canicola*.

On the 8th day the patient complained of pain in his muscles and behind his eyes, the latter being aggravated by moving the eyes. The conjunctivæ were bright orange. The optic discs were more injected than before. Scattered râles were audible over both lung fields. A radiogram of the chest revealed scattered areas of consolidation in the right lung field, with a denser and more defined circular opacity about an inch in diameter in the subapical segment of the right upper lobe. Culture of the sputum yielded a mixed flora. The serum-bilirubin was 12 mg. per 100 ml. No malarial parasites were detected in thick and thin blood films collected at four-hour intervals over 24 hours. Penicillin was begun in a dosage of 50,000 units three-hourly.

The patient's condition was unchanged on the 9th day. A polymorph leucocytosis was still present in the blood. The blood-urea was 60 mg. per 100 ml. and the prothrombin-time was increased.

The patient's temperature was normal 48 hours after the start of penicillin therapy. On the 12th day of the illness he had been afebrile for 24 hours and was feeling better. The jaundice was less intense, and the pulmonary physical signs were less well marked. The lower border of the liver was palpable two finger-breadths below the right costal margin.

Penicillin was withheld on the 16th day of the illness after a total dosage of 2,300,000 units. The patient was then symptomless, and the blood-urea, serum-bilirubin, and leucocyte-count were within normal limits. A radiogram of the chest showed a well-defined right subapical opacity, which had been noted in the previous film, but no other abnormality. There were no abnormal pulmonary physical signs.

The following serological investigations were performed at this stage of the disease:

Estimation of titre of agglutinins to Herzerburg strain of *Rickettsia burnetti*	Negative at 1 in 10.
Cold agglutination	Nil detected.
Complement-fixation test for antibody to psittacosis virus	Nil detected.
Paul-Bunnell reaction	Negative at 1 in 4.
Estimation of titre of anti-leptospiral agglutinins	Positive at 1 in 1000.
Hirst's test for antibodies to influenza viruses A and B	Negative.

Pyrexia recurred on the 17th day of the illness, the day after the cessation of penicillin therapy, and irregular fever persisted until the 42nd day, accompanied by profuse perspiration and a polymorph leucocytosis. A moderate general enlargement of lymph-glands was detected on the 22nd day. There was no splenomegaly, and the hepatomegaly present earlier had now subsided.

No pathogenic organisms were detected by repeated microscopy and culture of the fæces. Diaphragmatic movements were normal. Blood-cultures were negative. Full examination of the upper respiratory tract, including radiological examination of the sinuses and antrum puncture, revealed no cause for the fever and leucocytosis. The Paul-Bunnell test remained negative. The Takata-Ara reaction was positive (++) and the serum-bilirubin was 0·2 mg. per 100 ml. on the 29th day.

Treatment with penicillin 60,000 units three-hourly was begun on the 29th day and continued until the 51st day.

The patient's condition improved slowly, and he left hospital about 60 days after the onset of the illness. There was no sequelæ. Convalescence was interrupted by bouts of severe sphenopalatine neuralgia, which was treated by anæsthetisation of the sphenopalatine ganglion on several occasions.

Case 5.—A woman, aged 26, became ill on Nov. 14, 1948, with an acute onset of general malaise, feverishness, anorexia, muscle pains, and retro-orbital headache. Next day she also complained of nausea, vomiting, and pains on moving the eyes. She was admitted to hospital on Nov. 19, the 6th day of pyrexia.

She had had no significant previous illnesses, except that in October, 1948, a week after being thoroughly soaked when out shooting, she had complained of urgency of micturition and noted that her urine was bloodstained. She was admitted to hospital next day and cystoscoped. With fluids ad lib and potassium citrate her urine became normal, and in about 5 days was discharged to full duty. She had had no urinary symptoms since. The hæmaturia was believed to have been due to oxaluria.

On admission her temperature was 101·2°F, pulse-rate 80, and respirations 20 per min.

On Nov. 20 the patient was febrile and complained of severe retro-orbital headache, pain in and around the eyes and on moving the eyes, muscle pains, and vomiting. There was no rash, no enlargement of the liver or spleen, no lymphadenopathy, and no conjunctival injection, although there was photophobia.

Radiography of the chest and sinuses showed nothing abnormal. Her white-cell count was 4300 per c.mm. (polymorphs 54%, lymphocytes 44%, monocytes 2%); Hb 95%. The urine was acid and contained albumin but no sugar; many epithelial cells and a few leucocytes were found microscopically. Cultures of blood and of urine were sterile.

On Nov. 21, the 8th day of pyrexia, her general condition remained unchanged, but there was definite though slight stiffness of the neck. Kernig's sign was not present.

Since the patient owned a lap-dog, we considered the neck stiffness to be an indication for lumbar puncture, but we did not do one, because there was a pustule on the skin.

Blood-serum taken on the 9th day of pyrexia showed partial agglutination to *L. icterohæmorrhagiæ* and *L. canicola* in a dilution of 1 in 10. On the same day treatment was started with intramuscular penicillin 200,000 units eight-hourly up to a total of 2,000,000 units.

Next day (Nov. 23) the patient's temperature was normal. She felt very much better, and there was no vomiting. She remained afebrile, her urine became normal, and she was discharged convalescent on Nov. 29.

The patient's blood and that of her dog were examined in December and found to be strongly positive for *L. canicola*; the findings were the same on Dec. 31 (47th day), when the patient had begun to complain again of pain in and behind her eyes just as she had during the febrile part of her illness.

On Feb. 5, 1949, she was readmitted to hospital with acute iritis which had started on Jan. 31 after she had watched a boxing tournament in a chilly and smoky atmosphere. Blood was taken for a leptospira-agglutination test on Feb. 8, the 86th day since the onset of the original illness, showed (see below). The Kahn flocculation test was negative. Investigations in this case are being continued.

Case 6.—A German maid, aged about 40, had a febrile illness similar to that of her mistress (case 5) but about a week later. On Feb. 8, 1949, about the 78th day from the onset of the illness, her blood was found to be positive for *L. canicola* to a titre of 1 in 300 and to agglutinate *L. icterohæmorrhagiæ* to a titre of 1 in 10. On the same day blood from case 5 (86th day) was found to be positive for *L. canicola* to a titre of 1 in 300 and agglutinated *L. icterohæmorrhagiæ* to 1 in 30. In view of the latest serological findings in case 5 "there seems no doubt that her maid was infected at the same time" (Dr. J. C. Broom, personal communication).

Case 5 said that both she and her maid wiped up her puppy's "pools" every day, so it is not unlikely that the

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disease was transmitted in each case through the skin of the hands which had come into contact with the infected puppy's urine.

The duration of the illness in case 6 was about the same as in case 5, but in case 6 the treatment was entirely symptomatic and there were no sequelæ or complications. No other investigations were carried out in case 6, who was treated at home under her own arrangements.

DISCUSSION

Canicola fever is by no means always mild. In case 4 the illness was very severe, suggesting infection with *L. icterohæmorrhagiæ*.

Treatment in cases 1, 2, and 3 was entirely symptomatic. Case 5 seemed to respond rapidly to penicillin, but this may have been coincidental. In this case the recrudescence of pains in and behind the eyes, and on moving the eyes, at the end of December, 1948, is of interest, as is the onset of acute iritis on the 78th day. It might be useful to seek evidence of infection with *L. canicola* in all cases of apparently idiopathic acute iritis.

In case 4 intramuscular penicillin seems to have had a beneficial action both times it was used—30,000 units three-hourly for 9 days, and 60,000 units three-hourly for 21 days. We feel that such cases with hepatic involvement and jaundice, with or without pulmonary infiltration, should be treated with large doses of penicillin for some weeks until the white-cell count is normal (if raised at the onset of treatment) and until all jaundice has gone and the lung fields are clear.

In cases 3 and 5 the lap-dogs gave positive serological tests for *L. canicola*, and case 4 had two dogs which both died from a vague illness which was characterised by diarrhœa and loss of fur and was diagnosed as severe distemper by a civilian veterinary surgeon. Patients with fever of uncertain origin should be closely questioned about ownership of, or association with, dogs. Case 4 admitted that his dogs often urinated on the vegetables in the kitchen, and that in his household vegetables were often served raw. Cases 1 and 2 had bathed in the same bathing-pool.

About eighty specimens of fresh warm alkaline urine collected at all stages of the disease in cases 1, 2, 3, and 4 were examined without success for *L. canicola*, and as a result we have given up this method of diagnostic investigation in such cases. Intraperitoneal injection of guineapigs proved unsuccessful. The golden hamster (*Crycetus auratus*) is the laboratory animal said to be the most susceptible to experimental infection with *L. canicola*. Agglutinin titres reached significant levels after the second week of the disease. Cross-agglutination with *L. icterohæmorrhagiæ* may occur.

A polymorph leucocytosis was the usual hæmatological finding, but a normal total or differential leucocyte-count may be found in canicola fever. Atypical lymphocytes were present in the blood in case 4. So far as we are aware this finding has not been recorded previously in canicola fever.

Our recent experiences suggest that more general awareness of the manifestations of canicola fever and the more frequent use of serological reactions may reveal a higher incidence of this disease.

We wish to thank Major-General F. R. H. Mollan, O.B.E., M.C., D.M.S., British Army of the Rhine, for permission to publish this paper; Colonel J. B. George, commanding a British military hospital, B.A.O.R., for permission to forward this paper for publication and for help with case 5; Brigadier F. J. O'Meara, consulting physician, B.A.O.R., for his constant encouragement; the Wellcome Laboratories of Tropical Medicine for the serological investigations; Lieut.-Colonel R. L. Townsend, R.A.M.C., and Major H. J. Voss, R.A.M.C., for the other laboratory investigations and helpful advice; Captain W. T. Hendry, R.A.M.C., who was responsible for the management of case 1 and whose case notes we have used; and Lieutenant G. Freeman, R.A.M.C., otologist, for help with case 4.

SURGERY IN PARKINSON'S DISEASE

DIVISION OF LATERAL PYRAMIDAL TRACT FOR TREMOR

REPORT ON FORTY-EIGHT OPERATIONS

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MANY drugs have been tried for the relief of the distressing symptoms of parkinsonism. None of them, however, has given impressive results. The first surgical attack on the syndrome appears to have been made by Pollock and Davis (1930), who divided sensory roots in an attempt to eliminate tremor; but they found that, though there was relief from rigidity, the tremor was not affected. Puusepp (1930) tried the effect of dividing the posterior columns of the spinal cord, but reduction of rigidity was the only beneficial result to set against the evident disadvantages of this cordotomy. Foerster and Gagel (1932) found that section of the anterolateral region of the spinal cord had no effect on the tremor or the rigidity.

Putnam made a courageous and determined attack on the disease in 1933 and published his results in 1940. It was known that, if a patient with parkinsonism had cerebral apoplexy, the tremor was abolished on the side of the paralysis. This fact, combined with Rothmann's (1903) observation that section of the lateral pyramidal tract in monkeys produced little disability, led Putnam to perform division of the lateral pyramidal tract for unilateral cases of parkinsonian tremor. He reported 7 cases in which the results appeared to be worth while (Putnam 1940). A cut in the cord was made to a depth of 4 mm. (fig. 1).

Bucy and Case (1939) abolished tremor by ablation of the motor and premotor cortex, but at the cost of cortical paralysis. Klemme (1945, 1948), working in St. Louis, claims that excision of the premotor cortex immediately in front of the electrically responsive motor area gives excellent results as regards both relief from tremor and restoration of function. He has performed many operations, but a detailed analysis of his results is awaited. He bases his operation on the contention that there is a balanced functional relation between the premotor cortex and the basal ganglia, transmitted by a premotor corticospinal bundle to the common-path cells. He believes that in parkinsonism this balance is disturbed by involvement of the basal ganglia, and that it is restored by excision of the premotor area. Klemme limits his operation to patients under the age of fifty.

The effect of total thyroidectomy on parkinsonism was reported by Myerson and Berlin (1934), but the operation has not established a place in the treatment of parkinsonism.

Dodd has performed cervical sympathectomy for parkinsonism and kindly referred some of these cases to me after operation because he considered that they had not been improved.

Myers (cited by Putnam 1940) claimed that tremor could be relieved by ablation of the head of the caudate nucleus, approached through the frontal lobe. This seems to be a formidable operation for the average case of parkinsonism.

RADICAL DIVISION OF LATERAL PYRAMIDAL TRACT

This account is based on work carried out at the neurosurgical centre at Oldchurch Hospital, Romford, the Royal Northern Hospital, and the West End Hospital for Nervous Diseases. The operation was a development

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of the cordotomy introduced by Putnam and described above.

It cannot be emphasised too strongly that cordotomy is not a cure for parkinsonism; but in carefully selected cases it offers a good prospect of relief from tremor.

Cases of parkinsonism vary a great deal from the classical syndrome (Parkinson 1817). Physicians are only too familiar with the advanced case of paralysis agitans, presenting the fixed facies, unmistakable tremor, gross disturbance of gait, cog-wheel rigidity, hyperptyalism, and, above all, helplessness out of all proportion to any paresis which may be present. Apart from avulsion of the auriculotemporal nerves for the relief of excessive salivation, I believe surgery has nothing to offer these tragic cases. On the other hand, there are many patients in whom the only, or outstanding, manifestation is disabling and embarrassing tremor. In the more fortunate cases

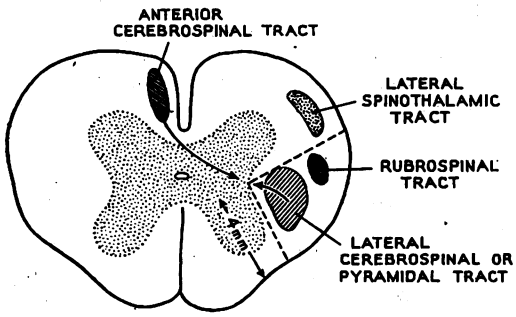

Fig. 1—Cross-section of spinal cord, showing extent of Putnam cordotomy and some of the tracts involved.

one side only is affected. The essential criterion for operation is that the patient should complain of the tremor as the symptom from which relief is desired, and other effects of the disease should be at a minimum. The patient selected for operation must have the mental capacity to coöperate in his rehabilitation. The operation is well tolerated by elderly people, and benign arterial hypertension is not a contra-indication.

Anæsthesia

The technique of the anæsthesia is governed by several factors, which include the poor physical condition of some of the patients, the necessity for disconnecting the apparatus while the patient is being arranged in the prone position, the acute flexion of the neck required by the surgeon, and the frequent use of diathermy during the operation. I am indebted to Dr. J. Fraulo for the following details:

'Omnopon' gr. $^1/_3$ and scopolamine gr. $^1/_{150}$ are given subcutaneously an hour before the beginning of the general anæsthetic. Immediately before the induction of anæsthesia the patient's throat is sprayed with a 10% solution of cocaine. Induction is accomplished with a mixture of nitrous oxide, oxygen, and a little ether, and then an acrylic tube, size 9 or 10, is passed into the trachea through the mouth. The throat is packed and the tube threaded through a London Hospital airway. The mouth and face are covered with strips of adhesive elastic bandage, and the tube is secured in place with strapping. When the patient's position is satisfactory, the tube is connected to the anæsthetic apparatus containing the usual carbon-dioxide absorption unit. The anæsthetic is continued with a combination of nitrous oxide and oxygen, with the addition of a little ether or cyclopropane if necessary.

Anæsthesia proceeds smoothly by this method. It is rarely necessary for the anæsthetist to compress the bag, the blood-pressure and pulse-rate remain steady throughout the operation, and blood-transfusion is not required.

The first 8 patients showed signs of collapse within ten minutes of the beginning of the operation; this was thought to be due to the sudden change of the position of the patient, combined with the effects of the adrenaline contained in the solution used for infiltrating the line of the skin incision. Since the adrenaline has been omitted there has been no further trouble of this kind. The effect of the adrenaline seemed to be confirmed by the fact that some of the early patients who had shown signs of shock did not do so when submitted to operation on the second side some months later, when the use of adrenaline had been given up.

Operation

The patient's eyes are protected with cotton-wool held in place with adhesive elastic bandage. The "cerebellar position" has been used in all cases, but the shoulder-pieces have been omitted because they force the scapulæ medially and thus interfere with the approach. To obtain adequate flexion of the head and neck, four soft pillows are placed under the patient's chest.

The incision extends from the seventh cervical spine to the external occipital protuberance. To control bleeding, pressure is applied to the skin edges by the assistant's fingers. The cut is extended through the deep fascia, to which fine artery forceps are applied as to the galea aponeurotica in the case of incisions into the scalp. The weight of the forceps helps to control bleeding from the skin and superficial fascia. Vessels that continue to bleed are coagulated by diathermy.

Absolute hæmostasis is essential, for even a small ooze of blood may completely obscure the site of the cordotomy. Thus, the muscle-fibres attached to the spine and laminæ of the second cervical vertebra are detached by picking them up in small bundles with a fine plain-ended pair of dissecting forceps and by dividing them after the instrument has been touched with the diathermy electrode.

The margins of the approach are separated by a "cerebellar" type of self-retaining retractor. The spine and laminæ of the second cervical vertebra are removed with a double-action rongeur. Troublesome bleeding from extradural vessels is avoided by inserting "patties" (small pieces of lintine attached to lengths of fine black silk) between the bone and the dura mater while the bone is removed. The whole of the lamina is removed on the chosen side, but very little of the lamina needs to be removed on the opposite side.

Next, the ligamentum flavum between the laminæ of the second and third cervical vertebræ is stripped off

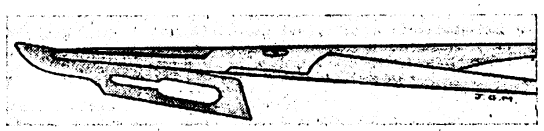

Fig. 2—A no. 15 Bard-Parker blade held in a pair of artery forceps 5 mm. from end of blade.

the dura. The dura is then picked up with a sharp hook and incised longitudinally with a small round-ended tenotome. Several traction sutures are inserted along the edges of this incision. The arachnoidal membrane is punctured and torn to expose the spinal cord. A no. 15 Bard-Parker blade is then clamped with a Halsted-type artery forceps so that 5 mm. of the blade projects beyond the beak of the forceps (fig. 2). With the cutting edge facing towards the anterior aspect of the spinal cord the point of the blade enters the cord at the site of entry of a convenient posterior nerve-rootlet. The blade is pushed into the cord as far as the end of the artery forceps and at an angle of 45° (figs. 3 and 4). The blade is swept outwards to complete the cordotomy. The extent of the cut can be checked by inserting a blunt instrument into the gap.

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The dura mater is then closed with interrupted fine black silk sutures on small round-bodied needles, and the muscles are brought together in two layers with thick silk. The skin margins are apposed with interrupted fine black silk stitches. The shortest operating time has been three-quarters of an hour, and the longest one and a half hours. Because the dura mater has been opened the patient is given an adequate course of penicillin.

Modified Operation

The operation seems to be easier if parts of the half-laminæ of the second and third vertebræ are removed on the selected side instead of the full width of the half-lamina of the second vertebra. According to the standard views of the position of the various tracts in the spinal cord, the cordotomy which has just been described should divide the whole of the crossed pyramidal tract, the rubrospinal tract, and the posterior spinocerebellar tract. Many of the patients who have had this cordotomy done have had patches of analgesia on the opposite side of the body, showing that the lateral spinothalamic tract has been slightly involved. The presence of these patches of loss of sensation should be regarded with satisfaction, because they show that the operation will give the greatest possible relief from tremor.

Postoperative Course

After operation there is usually an immediate but temporary hemiplegia. In most cases of unilateral parkinsonian tremor, and in many bilateral ones that have had a cordotomy on one side, this paralysis passes off in a matter of days. On the other hand, a few patients, in spite of a thorough and convincing division of the lateral column, have no detectable paresis. Some of those with bilateral tremor who have had a first-stage operation—i.e., a unilateral cordotomy—have taken many months to regain substantial strength on the side which has been operated on.

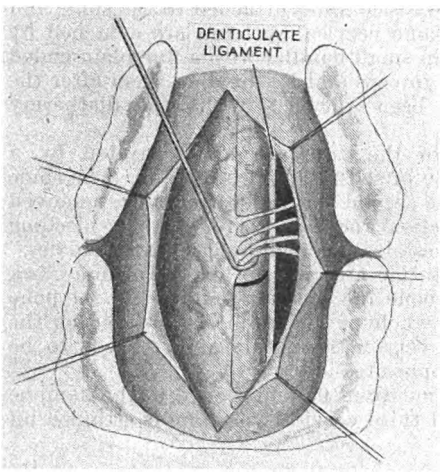

Fig. 3—Posterior surface of spinal cord, showing cordotomy close to a posterior spinal nerve-root which has been retracted with a dural hook.

RESULTS

Of the 48 patients operated on 3 died, giving a mortality of 6¼%, and 26 (54%) considered the operation to have been worth while. The objective results were as follows:

Condition	*No. of cases*
Tremor completely abolished	6 (12½%)
„ reduced to a negligible degree ..	18 (37½%)
„ unchanged	6 (12½%)
„ worse	6 (12½%)
Usefulness of arm improved	21 (43¾%)
„ unchanged	11 (23%)
„ worse	13 (27%)
Walking improved	12 (25%)
„ unchanged	16 (33½%)
„ worse	17 (35½%)

Minimum follow-up period, three months.

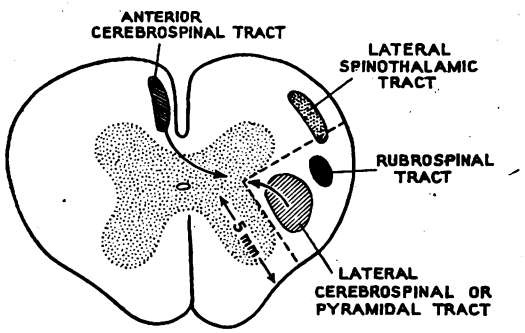

Fig. 4—Cross-section of spinal cord, showing extent of cordotomy as performed by author. Note encroachment on lateral spinothalamic tract.

From the analysis given above the conclusion is justifiable that cordotomy has a definite though modest place in the treatment of parkinsonism. The operation gives the best results in cases of unilateral tremor, and is indicated in a small proportion only of the bilateral cases in which life is made impossible by the violence of the tremor. The second side should be done after an interval depending on the rate of rehabilitation and usually amounting to several months. If a bilateral cordotomy is performed at one operation, restoration of function is likely to be difficult and prolonged.

Let it be emphasised again that in most patients gross disability is the outstanding feature and the tremor is a secondary consideration. If cordotomy is undertaken for this, the classical syndrome, the patients will be made worse and the procedure will fall into disrepute.

On the other hand, surgery does offer worth-while amelioration for those cases in which tremor is practically the only manifestation and the patient desires above all else to be relieved of the tremor. When other effects of the disease, such as paresis, disability, and emotional changes are pronounced, cordotomy will only make matters worse.

NEUROLOGY

The crossed pyramidal tracts appear to be much less important than was generally thought. Indeed it seems that in some people they may not even exist. In those patients in whom no postoperative paresis was observed it was at first assumed that the cordotomy had been inaccurate, though on each occasion the extent of the cut in the cord had been verified with a blunt instrument. In one case cordotomy on one side relieved the tremor but produced no weakness. This was assumed to have been due to a personal error on the part of the operator; but, when this patient had the other side operated on, there was again no postoperative weakness, and the second cordotomy was very carefully checked. In the early cases the knife was inserted 4 mm. into the cord; but, because the results were unsatisfactory, the depth was increased to 5 mm. This often gave rise to islands of analgesia, indicating a very radical cut into the lateral column.

Division of the posterior spinocerebellar tract on one or both sides appears to be without demonstrable effect.

If the rubrospinal tract lies immediately anterior to the crossed pyramidal tract, the cordotomy described above would divide all the rubrospinal fibres.

According to Brain and Strauss (1945) the nerve-fibres controlling bladder function are in the most dorsal part of the lateral column of the spinal cord. However, in some of the earlier cases in which a bilateral cordotomy was done at one operation there was never more than a few days' retention of urine.

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In none of the cases, whether of unilateral or of bilateral cordotomy, has a Horner's syndrome been observed.

Most of the cases where a 5 mm. cordotomy has been done have either had a negative plantar response or a positive Babinski reflex after operation.

In none of the patients has it been possible to demonstrate any posterior-column loss after operation. The islands of analgesia found on the opposite side have receded to some extent. The phenomenon of "spinal shock" seems to be either absent or minimal. It is suggested that the return of power on the side of the cordotomy is due to the direct pyramidal tract of the opposite side taking over the function of the divided crossed pyramidal tract.

DIAGNOSIS

All the cases submitted to operation had been diagnosed by neurologists before being seen by me. All the cases examined with a view to operation had been referred with the diagnosis of either Parkinson's disease or postencephalitic parkinsonism, and in no instance did there appear to be the slightest doubt about the diagnosis.

MANAGEMENT OF PARKINSONISM

A discussion of the use of drugs would be out of place in this paper, but there are points in the management of parkinsonism of interest both to physician and surgeon. The sufferer from Parkinson's disease becomes the object of excessive sympathy, and this can hardly be surprising when the symptoms are so obvious and distressing. However, there is nothing worse for these patients, and nothing more likely to render them completely bedridden, than this well-meaning, overindulgent "kindness." The patients must always be encouraged to do as much as their remaining ability will allow—no more and no less. The devotion of relatives is incredible, but nothing is more pathetic than the patient who has been reduced to the level of a helpless "pet" in the family circle. Lassitude is one of the features of the generalised form of the disease, and combined with the sympathy which the disease provokes, it soon renders the patient completely helpless.

In most hospitals patients spend too much of their time in bed. Unnecessary rest in bed delays the recovery of most neurological cases. Patients should not require permission to get up, but, on the contrary, should have to obtain permission to be in bed.

SUMMARY

The effects of division of the pyramidal tracts for the tremor of parkinsonism are described.

The operation is in no sense a cure for either Parkinson's disease or postencephalitic parkinsonism, but a measure for the relief of tremor, to be adopted only in very carefully selected cases in which tremor is the predominant manifestation and other effects of the disease are minimal.

The neurological implications of cordotomy involving the region of the crossed pyramidal tract are described.

Especially in unilateral cases, division of the crossed pyramidal tract offers a good prospect of substantial relief from tremor without permanent paresis.

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PARA-AMINOSALICYLIC ACID (P.A.S.) IN PULMONARY TUBERCULOSIS

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THIS paper is a sequel to the original paper by Dempsey and Logg (1947). We shall deal here with the cases of the "pulmonary series" mentioned in that paper, and also with new cases treated at Grove Park Hospital with P.A.S. since August, 1948. Since early in 1947 this remedy has been used at the hospital in over 60 cases of pulmonary tuberculosis. Our work is independent of the clinical trials now being conducted by the Medical Research Council in conjunction with the British Tuberculosis Association.

HISTORICAL

The compound P.A.S. was first synthesised by Seidel and Bittner in 1902 as a white powder decomposing at 140–150°C into meta-aminophenol, and it was one of a series of salicylic-acid products investigated by Lehmann (1946a, 1947a). Bernheim (1940, 1941) showed that sodium salicylate would increase the oxygen uptake of tubercle bacilli, and he suggested that it, or its derivatives, may be metabolites of that bacillus. He also found that, whereas salicylic and benzoic acids had this property, their homologues were inactive. Lehmann (1946a) reported in this journal that, of more than fifty derivatives of benzoic acid he had studied, the most actively tuberculostatic one was P.A.S., which produced an inhibition of 50–75% in a concentration of 0·15 mg. per 100 ml. when B.C.G. was used as the test organism. He also showed that the tuberculostatic effect was abolished if the amino grouping, instead of being at position 4 as in P.A.S., was at position 3 or 5, or if this grouping was replaced, for example, by NO_2. In animal experiments Lehmann found that P.A.S. was non-toxic to rats when given "in a concentration of 5% in a synthetic food" but was toxic to guineapigs. He reported 2 cases of pulmonary tuberculosis treated with P.A.S. from May to June, 1944, and this, together with the work of Vallentin (1946), constitutes the earliest recorded clinical use of P.A.S.

Vallentin (1946) reported from Gothenburg further experience with P.A.S. in pulmonary and pleural tuberculosis and summarised his results as "fairly promising."

The experimental observations of Lehmann were confirmed in Sweden by Sievers (1946), in America by Youmans (1946), and later by Feldman et al. (1947) at the Mayo Clinic. These last workers made several interesting points not previously reported:

(1) Unexpectedly low blood-levels of P.A.S. had a favourable influence on tuberculous infections in guineapigs.

(2) Guineapigs tolerated 4% of P.A.S. in their diet for a "continuous period of considerable duration."

(3) Tuberculostatic effects were seen with human-type tubercle bacilli strain H37Rv.

McClosky et al. (1948b) take Feldman et al. to task for some of their experimental work on P.A.S. They mention that the Mayo Clinic workers used a minute dose ($^1/_{500}$ of their own experimental dose) of the infecting bacilli, and that they fed the drug in the diet so that the actual daily intake was not accurately determinable but was only estimated as 3 g. per kg. of body-weight, "which, in guineapigs, was far in excess of the tolerated dose, and that the animals must actually have ingested much below this amount"—an argument supported by the statement of Feldman et al. that the blood-P.A.S. level in the treated animals was less than 0·5 mg. per 100 ml. McClosky et al. concluded that "P.A.S. has little therapeutic activity in rabbits infected with a bovine strain

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and in guineapigs infected with a human strain of tubercle bacilli," and that "in comparison with streptomycin . . . P.A.S. has little chemotherapeutic value when used alone, and does not potentiate streptomycin when used with it."

Youmans (1946), from some very thorough experiments on white mice, concluded that "P.A.S. is highly bacteriostatic in vitro for virulent human-type tubercle bacilli, including strains resistant to the bacteriostatic action of streptomycin, and is at least moderately effective for the suppression of tuberculous infections in white mice."

Since this experimental work was published, the favourable effect of P.A.S. in experimental tuberculosis has been well confirmed by Youmans et al. (1947), Alin and Difs (1947), Bray et al. (1948), and Duca et al. (1948), who examined a heterogeneous group of 19 compounds and found that only P.A.S. showed any appreciable activity (a bacteriostatic concentration of 0·1 mg. per 100 ml.).

It must be emphasised—as has been very succinctly recorded by Tobie (1948), working on *Myco. tuberculosis* 607—that it is only the pathogenic acid-alcohol-fast mycobacteria (the tubercle bacilli) which are sensitive to P.A.S. and that this constitutes a useful and important bacteriologically differentiating test.

Since clinical use of P.A.S. in tuberculosis was first described by Lehmann (1946a) and later in this country by Dempsey and Logg (1947), favourable reports have come from Ragaz (1948) in Switzerland and from Erdei and Snell (1948) in England. More recently, detailed reports of cases of pulmonary tuberculosis treated with P.A.S. have been published by the following workers:

(1) Steinlin and Wilhelmi (1948) used 'Aminacyl' (a proprietary brand of P.A.S.) both as a 20% solution and in dragees. In their series treated with aminacyl alone (12 g. a day) they note a decrease in temperature and in erythrocyte-sedimentation rate (E.S.R.), an increase in weight, and an improvement in well-being in most cases. They also describe results with aminacyl and streptomycin combined, and with aminacyl applied locally.

(2) Carstensen and Sjolin (1948), who have treated about 130 cases of pulmonary tuberculosis with P.A.S., report 22 cases, mostly of acute pulmonary tuberculosis, all complicated by intestinal tuberculosis, about the diagnosis of which they are most careful. They conclude that P.A.S. "is extremely active against secondary intestinal tuberculosis" and seems to have "a good effect on fresh tuberculous lesions."

(3) Lemming (1949) has "treated 80 cases of pulmonary tuberculosis with P.A.S. and obtained good results, especially with exudative lesions," and describes an interesting case of pulmonary and cutaneous tuberculosis in which a tuberculous ulcer of long standing healed after local applications of a neutral solution of P.A.S.

Much of the work on the chemistry and pharmacology of P.A.S. has been done in the research department of Herts Pharmaceuticals Ltd. (Simmonite et al. 1948, Goodacre et al. 1948), where important facts on the stability and decarboxylation of P.A.S. and its sodium salt have been noted. These workers point out that the unbuffered free acid is 80% decomposed in 10 min. and 90% decomposed in 30 min., whereas the sodium salt of the acid is hardly decomposed after boiling for 140 min. —as the pH value increases decomposition becomes slower. After giving details of the methods used in their laboratory for the assay of P.A.S., Simmonite et al. conclude that the pure acid is relatively unstable in acid media and when heated, and that the sodium salt is more stable but should not be sterilised by autoclaving. Goodacre et al. and Davis (1948) emphasise that P.A.S. and its sodium salt readily decarboxylate when heated and are converted to meta-aminophenol with the liberation of carbon dioxide. Solutions for parenteral use, therefore, must be sterilised not by autoclaving but by filtration. The colour of a solution of sodium P.A.S. bears no relation to the concentration of that substance present; this is emphasised by McAnally and Seymour (1948) and has been confirmed by the Government chemist's analysis of three different samples of P.A.S., one white and two coloured, all of which had different melting-points but were found to be of equal assay value (Davis 1948).

Much has been published on the estimation of P.A.S. in body fluids, particularly by Tennent and Leland (1948), Venkataraman et al. (1948), Klyne and Newhouse (1948), and Levaditi et al. (1948), most of whom use a modification of the Bratton and Marshall (1939) technique. In our experience some of these methods give erroneous results.

We have not found any report of the development of resistance to P.A.S. by strains of *Myco. tuberculosis*.

CLINICAL METHODS

From using a suspension of the crude acid we have now turned almost completely to the sodium salt of P.A.S. in solution for administration by mouth, which has been the main route employed in treatment. It was thought that this sodium salt had less unpleasant side-effects than the crude acid (see below).

Up to early 1948, P.A.S. was in comparatively short supply and a system of dosage had not been thoroughly worked out. However, with the great improvement in supplies and the ever-increasing knowledge of the substance, the scheme of dosage originally suggested at Grove Park has been modified and is now as follows:

	Dose (g.)						
	Mon.	*Tues.*	*Wed.*	*Thur.*	*Fri.*	*Sat.*	*Sun.*
9 A.M. ..	5	5	5	5	5	5	No P.A.S. given
11.30 A.M. ..	3	3	3	3	3	3	
2 P.M. ..	3	3	3	3	3	3	
4.30 P.M. ..	3	3	3	3	3	3	
7 P.M. ..	3	3	3	3	3	3	
9.30 P.M. ..	3	3	3	3	3	3	
1 A.M. ..	5	5	–	–	–	–	
5 A.M. ..	5	5	–	–	–	–	

20% solution used (1 g. in 5 ml.).

Strictly adhered to, this scheme of 20–30 g. a day seems to have given the best results, and blood-levels of 11–17 mg. per 100 ml. have been obtained. The daily amount is greater than the 14 g. recommended by Lehmann, the 10 g. recommended in America, and the 12 g. used by Steinlin and Wilhelmi. Occasionally the last, and even both, of the night doses have been omitted in extremely ill patients for whom a good night's sleep was of paramount importance, but this does not materially affect the analysis of the results.

Each patient under treatment has been carefully examined at regular intervals—full sputum examinations, a bacillary count in many instances, a recording of the appearance of the organisms, regular weekly urine analyses, blood pictures, and weekly to fortnightly checks on radiograms, E.S.R., and weight.

It has been found impracticable to maintain any secrecy among the patients being treated with P.A.S. about the fact that they are receiving a comparatively new drug, so careful psychological estimations of the patient and his reaction to being treated with P.A.S. have had to be made and allowed for in assessing improvement in the general condition, cough, &c., as well as in the analysis of toxic effects.

RESULTS

In all, 37 cases have been carefully analysed. These include cases treated since April, 1947, and some treated since August, 1948. Whether they are early or late cases from the point of view of start of treatment, we consider that sufficient time has not yet elapsed for a true assessment of the results. Hence any picture given here is essentially tentative; indeed, many of the patients are still in hospital and under treatment. All cases were those in which the disease was sputum-positive and radiologically progressive during 2–6 months before the start of treatment. They are essentially

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acute—usually bilateral—exudative pulmonary tuberculosis, either of recent development or as a result of spread from previously existing disease of any type—e.g., chronic fibrous, cavitated, &c.

The patients were aged 17–52, average 27. All were febrile and had one or more of the recognised signs or symptoms of activity—e.g., hæmoptysis and night sweating.

Temperature.—Of the 37 patients, 31 showed some reduction in pyrexia, definitely associated with the start of treatment. Acute swinging temperatures tended to resolve into a low-grade pyrexia in three or four days, and the temperature became normal sooner than in the cases which started with a low-grade pyrexia of 99–99·6°F. In all the 6 cases where the pyrexia was unaffected by P.A.S. it was of the low-grade type.

Sputum.—In 35 cases the sputum was greatly reduced in amount and became less purulent. This almost invariable reduction in the amount of sputum is the most remarkable feature during treatment with P.A.S. It leads, as might be expected, to a great improvement in the patient's general condition, for he becomes very interested in the day-by-day decrease of his sputum, and also sleeps better.

Cough.—All cases showed a great reduction in cough, especially at night.

E.S.R.—Of the 7 extremely ill patients, in 6 there was a reduction in E.S.R. under treatment with P.A.S. which could not be related to merely resting in bed. A typical example was the reduction of an E.S.R. of 89 mm. in 1 hr. (Westergren) to one of 17 mm. on the start of treatment; the E.S.R. never went above 24 afterwards. Of the remaining 30 cases, 16 showed a definite decrease in the E.S.R. and 11 a doubtful decrease; the remainder were unaffected.

Weight and General Condition.—With the improvement in troublesome symptoms and with rest in bed the general condition improved to some extent in all these cases. In all the severely ill patients, however, improvement in general well-being was remarkable—out of all proportion to what might have been expected without P.A.S. Gain in weight accompanied this improvement but was, on the whole, no more than has been seen in slowly improving controls not receiving P.A.S.

Bacteriology.—The sputum remained positive in 30 cases, and 6 were truly converted after repeated examinations over three to six months or more. However, the morphological appearance of the bacilli was radically changed in 17 of these 30 positive cases. The organisms appeared granular, beaded, and occasionally striate. The granules were in all cases acid-fast, and these "battered bacilli" could not all be grown on either Dubos or solid media.

Radiology.—A reduction in size of pulmonary tuberculous cavities was occasionally seen, and this was thought to be due to an effect on the associated endobronchial disease. Before streptomycin became available for bronchial tuberculosis this effect was often manifested in the re-expansion of atelectatic segments during collapse therapy and the improvement in demonstrable bronchial lesions. Apart from these radiological changes the lesions of chronic type seemed to be much less affected by P.A.S., and the predominantly fibrous areas not at all. The striking radiological finding in the 37 cases was that radiological improvement lagged well behind clinical improvement and reduction in toxicity. As has been mentioned, the cases included in the trial were essentially those with acute exudative lesions, either alone or in conjunction with previously existing more chronic disease, and in these acute pictures 7 cases showed considerable improvement, 17 moderate improvement, 9 slight improvement, and 4 no detectable change. In the improved cases radiography showed less confluent patches, with a tendency to fibrotic proliferative nodulation, and a general "cooling off" appearance similar to that obtained after a successful pneumoperitoneum for basal exudative disease, and comparable (but less obvious and taking longer to develop) to pulmonary tuberculosis which has responded well to streptomycin.

SIDE-EFFECTS

Most clinical reports refer to gastro-intestinal disturbance at the start of P.A.S. therapy, and this has, to some extent, occurred in 22 of our 37 cases, though in only 2 was it severe enough to necessitate withdrawal of the drug, and that only temporary. In the cases treated recently this effect has become notably slighter, and it is thought that the nausea, vomiting, and diarrhœa are due to the following two main causes:

(1) The inadequacy of the interrupted dosage scheme previously followed.

(2) Impurities in the commercial preparations, which have become less with improved techniques of synthesis and the more frequent use of the sodium salt.

Four cases developed frank hæmaturia and albuminuria, with a deposit of P.A.S. crystals in the urine. Three cleared on treatment with alkalis and withdrawal of P.A.S. for a few days, with no further effects on restarting treatment. The fourth case developed albuminuria which required several weeks' treatment, and P.A.S. therapy was not resumed. Alkalinisation of the urine should be a routine of P.A.S. therapy.

In our experience P.A.S. is remarkably free from serious toxic effects and can be given without interruption for many months without serious untoward results.

DISCUSSION

The tuberculostatic action of P.A.S., judged by the experimental work and the bacteriological findings in sanatorium practice, cannot now be doubted. The mode of action is still uncertain. Lehmann's view that the bacteriostatic action of P.A.S. results from the alteration in deamination of the amino-acids is challenged by Youmans, who inclines to the view that P.A.S. alters pulmonary tissue reaction from exudative to proliferative by an effect on the enzymic mechanism of the tubercle bacillus. We are impressed with the direct action that P.A.S. seems to exert on the host, as shown by the fact that the patient's feeling of well-being, the antipyretic effect, and the improvement in the general condition are the most constant results of treatment. These effects could be explained by a reduction in the virulence of the bacillus, but there is little or no evidence of any such reduction, and the rapidity of the clinical improvement—e.g., the fall in temperature—is against it. The morphological alteration of the bacilli, which is very definite under the microscope, points to a direct effect also on the bacillus, while the radiological changes noted in the lungs support Youmans's view. The mode of action probably consists of different mechanisms operating to various degrees in different cases according to the local pathology.

In practice the low toxicity of P.A.S. and its apparent lack of any tendency to produce resistant strains give it advantages over streptomycin in the treatment of exudative lesions, more particularly where the infecting strain is streptomycin-resistant and in the cases—fortunately becoming rarer—where streptomycin has produced toxic effects in the central nervous system.

The general principles of P.A.S. treatment in pulmonary tuberculosis are the same as with other chemotherapeutic agents and can be summed up as follows: except in the miliary forms of tuberculosis, chemotherapy should be used to achieve a definite goal; this is not necessarily the "cure" of the disease, as shown by sputum conversion, radiological healing, &c., but is merely a point at which the next stage of treatment—collapse therapy, or major pulmonary surgery—can be carried out. The

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patient's natural powers of "resistance" may be enhanced so that further improvement can be expected on continued rest in bed.

Used with this target in mind, we have found that P.A.S. can be a valuable auxiliary measure in the treatment of acute pulmonary tuberculosis, and that many collapse measures could be performed in cases which, without P.A.S., would either have deteriorated or have improved to a degree at which collapse measures were still impracticable.

SUMMARY

An analysis has been made of 37 cases of active pulmonary tuberculosis treated with P.A.S. at Grove Park Hospital in 1947–48.

From these and other cases it seems that the main value of P.A.S. in pulmonary tuberculosis is in the acute exudative type of disease, particularly in ill toxic febrile patients.

Such effects as reduction in temperature, fall in E.S.R., gain in weight, and a feeling of well-being occur long before radiological improvement can be demonstrated, and, once present, they remain during treatment.

P.A.S.—and any other chemotherapeutic substance in pulmonary tuberculosis—should be given with a definite goal in view, rather than as "just something else to try," and cases for treatment should be chosen accordingly.

Treatment with P.A.S. often has the important effect of making patients fit for collapse therapy.

The relationship of P.A.S. to streptomycin in the treatment of pulmonary tuberculosis is discussed. Patients with acute postoperative and other types of acute pulmonary tuberculosis should not be denied streptomycin, but the value of P.A.S. in such cases, either in conjunction with streptomycin or after its use, should be realised; though P.A.S. must not be looked on as a substitute for the accepted forms of non-chemotherapeutic treatment.

We wish to thank Dr. T. G. Dempsey, formerly acting deputy medical superintendent at this hospital, who was associated with the treatment of the cases up to August, 1948; Dr. B. R. Bentley-Turner, Dr. G. Beven, Dr. D. McCaully, and Dr. A. Sakula for their painstaking efforts with these cases; Dr. E. H. Bailey for much advice on the bacteriology and pathology; Mr. E. J. White, of the Grove Park Hospital laboratory; and all the nurses who coöperated in these clinical trials which caused them much additional work.

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MEGALOBLASTIC ANÆMIA IN AN INFANT

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MACROCYTIC anæmia due to deficiency of the hæmopoietic factor and responding to treatment with liver extract or folic acid has not often been reported in children. Davis (1944) reviewed 16 cases above the age of infancy and added 3 of his own. Single cases in infants have been reported from time to time (Bachman 1936, Langmead and Doniach 1937, Cole 1941, Fouts and Garber 1942, Kaplan and Bernard 1946, among others). Zuelzer and Ogden (1946) reported 25 cases of megaloblastic anæmia in early infancy. The anæmia was severe, normochromic and usually macrocytic, and associated with leucopenia, neutropenia, and thrombocytopenia. The liver was enlarged in every case; the spleen was palpable in 10 cases. In every case erythropoiesis was megaloblastic and indistinguishable from that seen in true addisonian anæmia. The anæmia responded satisfactorily to folic acid or liver extract. Since recovery was permanent, it is clear that these were not cases of addisonian pernicious anæmia. Siebenthal (1948) has reported an additional 2 precisely similar cases.

The occurrence of true pernicious anæmia in infancy has always been open to doubt. Most cases reported do not satisfy the criteria essential to this disease. Peterson and Dunn (1946) reported a probable case in which the marrow was megaloblastic, there was a histamine-fast achlorhydria, liver therapy produced a reticulocyte response, and maintenance therapy was necessary.

It is doubtful if the "megaloblastic anæmia of infancy" (Zuelzer and Ogden 1946) is as common in this country as in the United States. None the less, cases will be missed unless marrow study is regarded as essential in cases of normochromic anæmia in infancy. This prompts us to record a case which appears to be identical with the cases described by Zuelzer and Ogden (1946), Kaplan and Bernard (1946), and Siebenthal (1948).

CASE-RECORD

A girl, aged a year and 5 months, was an only child, born spontaneously after a normal pregnancy. Her birth weight was 7½ lb. She was breast-fed for 8 weeks, when owing to insufficient milk the feeds were changed to boiled cow's milk. She received only irregular doses of vitamin D. She sat up alone at 8 months, and walked at a year and 3 months. At the age of 6 months she had gastro-enteritis, which responded to dietetic measures at home.

On Sept. 5, 1947, when just over a year of age, she was admitted to another hospital because of increasing pallor following the enteritis. At that time she was found to be

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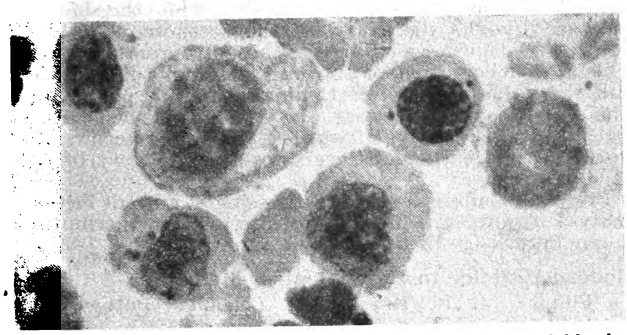

Fig. 1—Marrow film on April 26, 1948, showing megaloblastic erythropoiesis. (× 780.)

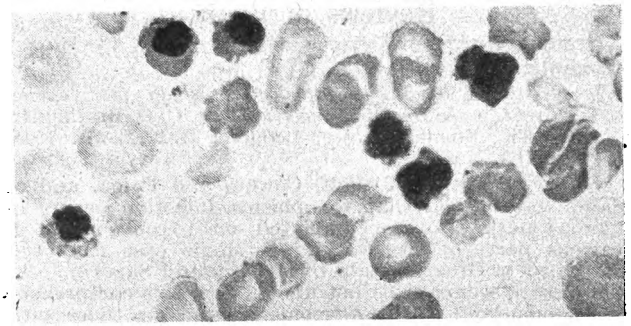

Fig. 3—Marrow film on May 11, 1948, after 8 days' treatment with folic acid only, showing normoblastic erythropoiesis. (× 780.)

a "plump" infant with well-marked pallor, tachycardia, and generalised œdema. The spleen was impalpable. Blood examination showed: Hb 30% (Sahli); red cells 1,340,000 and white cells 7600 per c.mm. Films were said to show poorly hæmoglobinised red cells, and for this reason the child was regarded as having iron-deficiency anæmia. She was treated with a "blunderbuss" of 'Plexan' (five injections of 2 ml. at 4-day intervals), ferrous sulphate in large doses, and ascorbic acid. She improved rapidly and was discharged home on Oct. 9, 1947, when her hæmoglobin was 70%.

She remained well until January, 1948, when after an attack of diarrhœa and vomiting she again became very pale. She was readmitted to hospital on Feb. 28. On this occasion her hæmoglobin was 35% (Sahli) and her red-cell count 2,160,000 per c.mm. She was treated with large doses of ferrous sulphate and ascorbic acid without improvement, and was transferred to the Royal Hospital for Sick Children, Glasgow, on April 20, 1948, after six weeks' unsuccessful therapy.

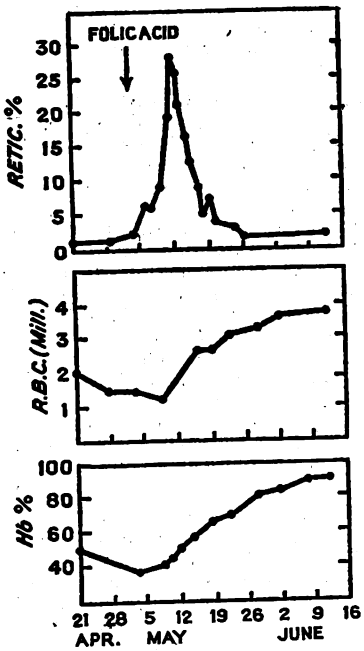

Fig. 2—Blood response to folic acid.

On admission she was very pale and weighed only 69% of the expected weight for her age. There was no glandular enlargement or œdema. The heart was slightly enlarged, but the sounds were pure. The spleen was impalpable. The liver was not enlarged. Blood examination: Hb 7·65 g. per 100 ml. (50% Sahli); red cells 1,840,000 and white cells 11,400 per c.mm.; colour-index 1·36; mean corpuscular hæmoglobin concentration (M.C.H.C.) 36·6%; mean corpuscular volume (M.C.V.) 112·3 c.μ; and reticulocytes 1%. Films showed anisocytosis and anisochromia; poikilocytes were abundant; many well-coloured macrocytes were seen, and small ring-staining cells were even more plentiful.

The tibial marrow on April 26 showed typical megaloblastic erythropoiesis (fig. 1).

Radiograms of bones and chest were normal. Blood non-protein nitrogen was 23 mg. per 100 ml. Fæcal fat analysis gave normal figures.

A fractional test-meal on April 30 revealed achlorhydria but when this was repeated with histamine on May 3, the free hydrochloric acid was within the normal range.

Treatment with folic acid by mouth was started on May 3, when the blood findings (fig. 2) were: Hb 5·81 g. per 100 ml. (38% Sahli); red cells 1,410,000 and white cells 5800 per c.mm. colour-index 1·36; M.C.H.C. 34·5%; and M.C.V. 119·2 c.μ. The dosage of folic acid was 5 mg. twice daily until May 8, when it was increased to 10 mg. twice daily and continued until the patient's discharge from hospital on June 15. From May 25 she received also ferrous sulphate gr. 3 thrice daily.

The administration of folic acid was followed by rapid improvement (fig. 2). The peak reticulocyte response of 28% was reached on May 11, after 8 days' treatment with folic acid alone. The bone-marrow on that date showed entirely normoblastic erythropoiesis with hyperplasia of the marrow (fig. 3).

At the time of the patient's return home on June 15 the blood picture was Hb 13·77 g. per 100 ml. (90% Sahli); red cells 3,630,000 and white cells 10,800 per c.mm.; colour-index 1·23; and reticulocytes 2·5%.

The child was seen as an outpatient on Sept. 7, when she seemed very well, though she had had an attack of diarrhœa and vomiting a week previously. Blood examination showed Hb 13·2 g. per 100 ml. (86% Sahli); red cells 3,950,000 and white cells 8200 per c.mm.

DISCUSSION

The occurrence of megaloblastic erythropoiesis in an infant with severe anæmia led us to expect that folic acid would prove beneficial; this was confirmed in practice. The presence of free hydrochloric acid in the gastric juice indicates that this was not a case of addisonian pernicious anæmia but presumably associated with a temporary deficiency or failure of utilisation of the hæmopoietic principle. The previous history indicates that liver extract would also have been successful. It also points to the well-recognised tendency for polypharmacy to mask the true state of affairs in blood diseases, and to the desirability of marrow studies in cases of anæmia in later infancy, especially if macrocytosis is a feature. In this connexion, it may be pointed out also that a macrocytic anæmia may occur without megaloblastic erythropoiesis, and in such cases folic acid and liver extract cannot be expected to be helpful (Davis 1944, Zuelzer and Ogden 1946). Zuelzer and Ogden regard infection and nutritional deficiency as the principal ætiological factors in megaloblastic anæmia of infancy. The history of diarrhœa and vomiting in the present case suggests that both factors were operative in bringing about a temporary deficiency of the hæmopoietic principle.

SUMMARY

A case of megaloblastic anæmia in an infant which responded to folic acid is described.

The cause was presumed to be a temporary lack of hæmopoietic principle brought about by nutritional deficiency and infection.

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Reviews of Books

Toxoplasmosis

A Clinical and Histopathological Study with special reference to the Eye Manifestations. Dr. C. D. BINKHORST. Leyden: Stenfert-Kroese. London: H. K. Lewis. 1948. Pp. 163. 15*s*.

SINCE the work of Wolf, Cowen, and Paige, and of Sabin, established that toxoplasma infection occurs in man, reports have accumulated on toxoplasmosis in various parts of the world. A single case has been described in Great Britain by Jacoby and Sagorin.[1] As the disease seems to be not uncommon, this comprehensive monograph will be welcome not only to those with specialised interests but to other physicians and general practitioners. Dr. Binkhorst's presentation is clear and exhaustive without being too voluminous. There is a good description of the causative organism, supported by a plate from a paper by Brug and Vos. The diagnostic laboratory methods, especially animal inoculations and Sabin and Olitzky's neutralisation test, are described with sufficient detail to enable everybody to carry them out. He stresses the importance of inoculating many animals and of using guineapigs in addition to mice. Clinical findings are well described, the detailed ophthalmoscopic reports with 30 coloured illustrations demonstrating the changes in the fundus being particularly valuable. The iritis found in this disease is also illustrated by two coloured plates. There are besides several X-ray pictures and a few photomicrographs of histological sections. Dr. Binkhorst reports in detail 20 cases which he has personally observed. In 2 of these toxoplasma was demonstrable in sections, and the organism was isolated by animal inoculation. In 7 cases presenting symptoms of retino-encephalopathy the neutralisation test was positive and inoculation of guineapigs with the cerebrospinal fluid yielded a doubtfully positive result in 1 case. In 4 cases with positive neutralisation tests retinitis was the only clinical symptom. The other 7 cases presented clinical symptoms suggestive of toxoplasmosis, but animal inoculations with the cerebrospinal fluid (5 cases) and neutralisation tests (all cases) were negative. In 1 of these the mother's serum contained neutralising antibodies. Although Dr. Binkhorst favours the diagnosis of toxoplasmosis in these cases he notes that signs often regarded as pathognomonic—such as cerebral calcification—are by no means specific. In the discussion he correlates symptoms with pathological findings, and discusses the comparative frequency of stillbirths in mothers who gave birth to a child with congenital toxoplasmosis, and the symptoms found in mothers and siblings. He thinks that in most of his cases the infection was antenatal, but also presents evidence for postnatally acquired infection. No observations were made which could throw light on the mode of infection except in 1 case, where infection by a "very sick" cat was considered possible. Sulphonamides have been used, but the results of therapy are not discussed.

Tuberculosis in History

Prof. S. LYLE CUMMINS, C.B., C.M.G., M.D. London: Baillière, Tindall, and Cox. 1949. Pp. 205. 21*s*.

NOBODY is better fitted to discuss this question than Professor Cummins. Tuberculosis is ubiquitous and there is no definite immunity from it racially or climatically. The Greeks had a word for it—as far back as Hippocrates it was referred to as "phthisis." Centuries were to elapse however before the study of the disease claimed the attention of the great leaders of medicine. For a long time its diagnosis as an entity was clouded by vague theories, but gradually the mists cleared; Professor Cummins quotes Sydenham as pointing out that medicine depends upon observation, not hypotheses about disease. The valuable work of Richard Morton, and of Benjamin Martin (who first adumbrated the germ theory of the disease), is given due weight. In discussing the advent of pathology, which was to mean so much in diagnosis, he recalls especially the painstaking work of William Stark. To Carson we owe the development of artificial pneumothorax, to Auenbrugger the initiation of percussion as a means of diagnosis; while the share of Laënnec by the discovery of the stethoscope is well known. But perhaps exceeding these in importance was Villemin's recognition of the infectivity of tuberculosis, and the valuable work of Cohnheim in this connexion. The diagnosis of the disease was thus established pathologically and clinically. It was left for Koch to crown the work of these earlier observers by the discovery of the bacillus itself.

Professor Cummins writes engrossingly, and his critical analysis throws much light on the various contributors to our knowledge of this disease.

1. Jacoby, N. M., Sagorin, L. *Lancet*, 1948, ii, 926, 934.

Modern Practice in Psychological Medicine

Editor: J. R. REES, M.D. London: Butterworth. 1949. Pp. 475. 50*s*.

THIS composite textbook, intended for medical students and general practitioners, has twenty-nine contributors, most of whom evidently prefer discussion to description. The book therefore has fewer facts and details than is customary in medical textbooks, and this will result in giving the medical student who reads it an orientation rather than a body of knowledge. The editor has arranged the chapters according to what he considers their relative importance to the medical student. The first ten deal with health, "ourselves—the normal individual," abnormal psychology, the diagnostic interview, intelligence, types of personality, psychosomatic medicine, psychiatry and neurology, inheritance, and child development. Then come the chapters on the various neuroses and other mental disorders, delinquency, mental deficiency, and organic reaction types: followed by chapters concerned with therapeutics, industrial stress and psychotic illness, social work, and medicolegal aspects. Although the contributors have succeeded in avoiding jargon, not all of them have conquered the other psychiatric weakness—labouring the obvious.

Conférences cliniques de médecine infantile (3rd ed. Paris: Vigot Frères. 1949. Pp. 275).—This book by Dr. H. Grenet of l'Hôpital Bretonneau is a new edition of the third of six volumes of clinical lectures on pædiatrics. Like the others, it opens with a disquisition on medical ethics, this time on the relations between doctors. An interesting classification describes the useful consultation, the consultation for covering oneself, the de-luxe or fashionable consultation, and the death-bed consultation. "There are houses where one must not die without the presence of a renowned physician," and Dr. Grenet wisely relies on Proust to describe this last type. The lectures themselves are mainly on alimentary disorders and syphilis in infants. They are well written and mainly traditional. It is interesting to find three pages devoted to the radiological diagnosis of hypertrophic pyloric stenosis, and one paragraph to palpation of the tumour, which is considered to be possible in less than two-thirds of the cases—a proportion which would satisfy no British pædiatrician.

The Plant Alkaloids (4th ed. London: J. & A. Churchill. 1949. Pp. 804. 63*s*.).—This massive compilation by Mr. T. A. Henry, D.SC., is primarily a specialised reference book for chemists working with alkaloids, being a comprehensive and detailed account of the occurrence, chemical structure, properties, and reactions of the plant alkaloids, with methods of estimation. The sections on pharmacological actions are brief and the comments on therapeutics are, of necessity, general and even briefer. Pharmacology is considered especially in relation to alteration in biological action with change in the chemical structure of the molecules. Formulæ of bewildering complexity are set forth, often in lengthy series, but clearly and neatly; and references are profuse. For concentrated factual information few books of its size can compare with this work. The section dealing with the chemical constitution, alone, of the morphine subgroup of alkaloids has about 120 formulæ, nearly all graphic. For the average medical reader with some scientific interests about three or four dozen names of alkaloids may seem familiar; but the main use of the book for doctors will probably be to look up the pharmacology of less familiar alkaloids, either in relation to toxic effects or to the possibilities of experimental study which might lead to therapeutic use. The book is a monument to the knowledge and assiduity of the author and his assistants.

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THE LANCET

LONDON: SATURDAY, MAY 28, 1949

The Trained Nurse

AT long last there is to be a sharp upward movement in the salaries of the staff nurse and the ward sister, bringing the maximum rates to £415 and £500 respectively—if one includes the value of residential emoluments. The increase is overdue; in these post-war years there has been obvious incongruity between the old bases used in determining nurses' salaries and the new trade-union-sponsored approach to the wages of the manual workers in the hospitals. It is a pity that the present changes were not introduced last July at the same time as the revised allowances for the student nurse; for the contrast has no doubt had some influence on waverers and has encouraged them to leave the hospital service.

Is the upward movement adequate? It has been made more dramatic by the new plan of quoting a gross figure including residential emoluments; but these emoluments will no longer be free from income-tax. For the newly appointed staff nurse net receipts of £4 a week (subject to income-tax, pensions, and certain other deductions) are not excessive as a recognition of the professional status that her training has earned. Comparisons may be odious; but, even though she is entitled to cheap board and lodging, it will be asked why the newly qualified nurse should start at a gross salary of £315 while the newly qualified almoner gets £330 and the physiotherapist £340. To ask such questions is merely to bring out the fact that the process of adjusting nurses' remuneration from a vocational to a professional basis has not even now worked itself out. It is indeed a point of some importance that the Ministry of Health—if it is in earnest about the dependence of the whole hospital system on the nurse—should make sure that the various categories of medical auxiliaries, which vie with nursing in their claims upon the young womanhood of today, are not allowed to be just a step ahead of the nurse. "I try to get my best girls to take an interest in nursing," said the headmistress of a girls' public school the other day, "because I believe in the scope that nursing offers to the well-educated girl. But they all want to go in for physiotherapy or radiography." If a woman's salary ought to reflect, above all, the responsibility of her work, the staff nurse should be paid at least as highly as the almoner, the physiotherapist, or indeed any of the other medical auxiliaries. The correlation of these different categories of health worker is fast becoming a matter of urgency, and we hope that, when the salaries of the medical auxiliaries are under discussion, someone will be given a watching brief for the nurse.

More than on any other single factor, the prospect of developing a good hospital service depends on getting and keeping the necessary numbers of nurses. At present we are leaning too heavily on the student nurses of 17–22 years old, whose numbers cannot be expected to increase much more, and who tend to forsake hospital service soon after they qualify.[1] In such a situation it is essential to ensure that not only the pay but the status of the trained nurse in hospital is equal to the responsibility she carries, and is such as to induce able and educated women to remain in the work. It is well therefore to face the fact that in most hospitals the status of the staff nurse is not all it should be. Is there any justification for the idea that the qualified doctor is ipso facto on a different social level from the qualified nurse? Whatever the practice of the past may have been, the time has surely come when at any rate all the younger doctors, nurses, and medical auxiliaries should mess together; and the argument whereby the staff nurses are regarded as a little lower than the angels, and are accorded a dining-room of their own, appropriate to their position, should be regarded as a mark of obsolescence in the management of a hospital. If we are short of good staff nurses and the whole hospital service is imperilled thereby, we need not look much further than such practices and to the low pay that the staff nurses have been receiving. The new salaries are a step, but only one step, in the right direction.

Diagnosis of Anæmia in Childhood

THE new agents being introduced for the treatment of anæmia in adults—folic acid, vitamin B_{12}, intravenous iron, repeated blood-transfusion—should all be available for the treatment of children. Correct therapy now depends more than ever on accurate diagnosis, and it is here that pædiatric hæmatology tends to lag behind. Present-day hæmatological diagnosis rests on examinations of peripheral blood and of bone-marrow smears; other investigations come afterwards and are selected to fit particular cases. Examination of the peripheral blood is as easy in the child as in the adult, and interpretation presents no special difficulties once it is realised that the range of normal variation is wider in children. The child's blood has special features, like the well-known temporary anæmia soon after birth. Two others deserving notice are the lymphocytosis, sometimes including immature cells, which occurs in the first two years and may lead to an unwarranted diagnosis of leukæmia, and the fact that infection alone can produce very high counts of granular white cells—up to 100,000 per c.mm.—again including immature forms. This field has been well investigated, and the atlas of BLACKFAN and his colleagues[2] is a reliable guide to what is known.

Bone-marrow investigation in children is only beginning. Sternal puncture, the standard adult method, is not easily applied to children and is difficult or impossible before the age of 4 years. Tibial puncture, though practicable in infants up to 6 months old, is a formidable procedure at later ages, and, since the active bone-marrow recedes from the long-bone diaphyses early in life, representative samples may not be obtained. It is therefore in childhood that iliac-crest puncture is particularly valuable; the operation is simple, a reasonably large-bore needle can be used, and the puncture area is out of the patient's view.[3] The marrow so obtained

1. Report on a survey by the Nursing Recruitment Service, King Edward's Hospital Fund for London. *Lancet*, 1948, ii, 266.
2. Blackfan, K. D., Diamond, L. K., Leister, C. M. Atlas of the Blood in Children. New York, 1944.
3. *Lancet*, March 26, p. 530.

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is as representative as that from the sternum. The difficulties of bone-marrow biopsy have inevitably held up progress, and little more is now known about normal ranges and other vital matters than two years ago.[4] When bone-marrow studies in anæmia of childhood become as much part of routine as they have become in studies of adult blood disease, we shall soon have a reasonable idea of the range of normal variation and what constitute pathological deviations. It is also likely that new syndromes will come to light, and a good example is the megaloblastic anæmia of infancy, a case of which is reported in this issue by HUTCHISON and MACARTHUR. This condition, first recognised by ZUELZER and OGDEN in 1946, cannot be diagnosed without marrow studies.

In young children the commonest causes of anæmia are infection and defective nutrition, perhaps 70–90% of all anæmic children fall into these groups. The diagnostic problems arise with the remainder, particularly when the anæmia is normocytic or macrocytic. The likely causes of primary blood disease in a child are acute leukæmia, aplastic or "aregenerative" anæmia, hæmolytic anæmia, unrecognised cœliac disease, and the megaloblastic anæmia of infancy. With the exception of cœliac disease, these conditions have different marrow pictures and often cannot be certainly distinguished without bone-marrow biopsy. In cœliac disease the bone-marrow shows a normoblastic picture for a long time, even when the colour-index is over 1, but it is only when a megaloblastic picture is present that any response from folic acid can be expected. The leukæmias are often difficult to diagnose in children from the peripheral blood alone, and then the marrow provides the indispensable diagnostic clue by showing large numbers of immature cells like myeloblasts. Here again the normal lymphocytosis has to be reckoned with, and lymphocytosis in the marrow of a child has not the same diagnostic significance as it has in the adult. Hæmolytic anæmia can occur in acute and chronic forms in childhood, apart from the now thoroughly explored type caused by Rh incompatibility; congenital hæmolytic anæmia, with its typical alteration of red-cell fragility, has been diagnosed in the first two years of life; cases resembling the acquired type of adult life do appear from time to time; the bone-marrow in all these cases shows a typical normoblastic hyperplasia whatever the peripheral blood picture may be.

Of late years the general physician has been finding it difficult to keep up with advances in diagnosis and treatment in all fields. The same difficulty is now beginning to affect the pædiatrician. For instance, the possibility that some children with congenital heart disease are fit subjects for surgical treatment whereas others are not has led to the setting up in enlightened centres of special clinics in which the pædiatrician and the cardiologist coöperate. It may well be that similar coöperation is needed between the pædiatrician and those physicians who have made a special study of hæmatology. As long ago as 1927 the late Dr. K. D. BLACKFAN started a special hæmatological clinic at the Boston Infants' and Children's Hospital, and Dr. L. K. DIAMOND carries it on; they considered that the long-term personal observation that this clinic allowed was invaluable. There are signs that such integration of effort is badly needed. Thus, the latest edition of a deservedly popular English pædiatric textbook shows no evidence that its author has heard of recent views on red blood-cell formation and the classification of anæmias. "Blunderbuss" treatment is still far too common in the treatment of anæmia of childhood. New hæmatological diagnostic techniques that will, in proper hands, give important information are now available to the pædiatrician. It seems worth while considering practical methods of enabling the best use to be made of them.

4. *Ibid*, 1947, i, 146.

Hydrocephalus

THOUGH the physical features of hydrocephalus have been familiar to physicians from the earliest times, interest in the condition was formerly confined for the most part to those who collected monstrosities. It was not until the early part of this century that growing knowledge of intracranial hydrodynamics stimulated neurologists and neurosurgeons to intensive study of the mechanisms that may cause hydrocephalus. Much has thus been learned, including much that is useful in treatment; but the isolated worker in special departments has rarely seen enough (or sufficiently diverse) cases to present a comprehensive account of the pathology. Prof. DOROTHY RUSSELL'S monograph[1] goes far to remedy this deficiency: drawing her material from large general hospitals and from busy neurosurgical clinics, she has been able to investigate cases that might otherwise have been consigned to the archives of obstetrics, pædiatrics, neurosurgery, and general pathology. The results of her researches will interest a wide circle of clinicians who are faced with this admittedly depressing problem.

Professor RUSSELL is convinced that the cause of hydrocephalus is almost always obstruction of the circulation of the cerebrospinal fluid. In many cases gross lesions such as neoplasms are an obvious explanation of this obstruction. In others the site may be obvious but the nature of the obstruction may require careful investigation: for example, narrowing of the aqueduct of Sylvius is a common cause of hydrocephalus, but without microscopical study one cannot always say whether this is a congenital stenosis, or division ("forking") of the aqueduct into a number of minute channels, or the result of gliosis around the aqueduct. An important group of cases is that in which hydrocephalus results from leptomeningitis: the subarachnoid space may be diffusely matted up with unobtrusive adhesions, especially in the cisterna ambiens and at the base of the cerebral hemispheres, and the fluid may therefore be hindered from reaching the arachnoid villi where most of the absorption takes place. In such cases there is great ventricular dilatation, often with distension of the subarachnoid space in the posterior fossa. Now that so many patients recover from pyogenic meningitis, one might expect to see this sequel often; yet so far it has seemed to be very rare. But, as the process may be chronic, it may prove of more importance in the future.

What most clinicians will want to know is whether any more hopeful light can be thrown on "con-

1. *Spec. Rep. Ser. med. Res. Coun., Lond.* no. 265. H.M. Stationery Office. 1949. Pp. 138. 6s.

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genital" hydrocephalus. In some of these cases, hydrocephalus is present at birth and is due, among other causes, to developmental abnormalities of the aqueduct; but Professor RUSSELL believes that there are also some in which it develops in early infancy as a result of unrecognised (and usually untreated) meningitis from which the child recovers. More use of lumbar puncture in unexplained pyrexial illnesses of infancy would lead to the diagnosis and treatment of the meningitis and might prevent the hydrocephalus. Even in the other kinds of "congenital" hydrocephalus the hypothesis of obstruction justifies some optimism, or at least more optimism than the previous opinion that hydrocephalus is an irreparable maldevelopment probably associated with other developmental abnormalities. In ventriculography we have a technique that will often indicate the site of the obstruction during life; and surgery provides several measures that may deal with obstruction. With hydrocephalus in adults a simple decompression may occasionally ease things just enough to establish or restore an adequate circulation of the cerebrospinal fluid; but usually something more is necessary, and the introduction of ventriculostomy by STOOKEY and SCARFF was a great technical advance. In this operation a fistula is made between the third ventricle and the subarachnoid space at the base of the brain so that the fluid does not have to pass through the aqueduct, fourth ventricle, and posterior fossa, or cisterna ambiens, thus bypassing any obstruction in those parts. For success, however, the cisterna chiasmaticus must be patent, and this condition is not always fulfilled. In seeking an alternative, TORKILDSEN has devised the ingenious procedure of ventriculocisternostomy in which a tube is passed from the lateral ventricle to the cisterna magna, which allows the fluid to bypass the foramina of Monro, third ventricle, aqueduct, and fourth ventricle. This operation is widely practised nowadays because it is feasible in many cases where ventriculostomy would be difficult or impossible—e.g., in hydrocephalus due to tumour of the third ventricle.

Though these procedures often succeed in adults, it is a disappointing fact that they are usually ineffective in infancy—in the so-called congenital cases. Decompressions and bypassing operations cannot deal with diffuse obstructions in the subarachnoid space due to meningitis or birth hæmorrhage; and even where the primary lesion is amenable to treatment (for example, where it is a membrane over the foramen of Magendie) the subarachnoid space may be obliterated by long-standing ventricular distension. For these reasons attempts have been made to deal with the problem from the other end, by diminishing the secretion of cerebrospinal fluid. DANDY [2] tried excision of the choroid plexus by open operation, but this was a formidable procedure attended by a high mortality-rate, and it has been largely discarded. More recently PUTNAM [3] and SCARFF,[4] among others, have tried destruction of a large part of the choroid plexus by endoscopic electrocoagulation, and some success has been reported. This procedure will not deal with neuronal damage already done; and, even though the hydrodynamic result may be satisfactory, there may be physical or mental defects that make the cure considerably less than complete. It can be said, however, that with infants, older children, and adults it is usually impossible to select favourable cases without special investigations, or even trial operations; and they should all have the benefit of these investigations. Even though they carry risks, the alternative of doing nothing is almost always worse.

2. Dandy, W. E. *Bull. Johns Hopk. Hosp.* 1921, 32, 67.
3. Putnam, T. J. *New Engl. J. Med.* 1934, 210, 1373.
4. Scarff, J. E. *Amer. J. Dis. Child.* 1942, 63, 297.

Annotations

THE DENTIST'S EARNINGS

FOR the second time since the National Health Service began less than a year ago, the Minister of Health has found it necessary to reduce the fees of dentists. The first cut—one of 50% on gross earnings beyond £4800 per annum—was introduced on Feb. 1 [1]; and thereafter it was still possible to gain, without reduction, a net income some 25% in excess of the Spens Committee's [2] recommendations, "in consideration," says the Ministry of Health, "of the long hours which dentists were working in what was then believed to be a temporary rush." Any resentment that was felt against this first cut centred mostly on its imposition without prior negotiation. Against the new cut, which is explained on p. 929, the professional bodies have voiced the further objections that it is based on earnings in a period of abnormally high demand and on figures relating to only half the dentists in the service; already, they say, two-thirds of the profession in the service are earning only what the Spens Committee recommended, or less. The Ministry, for its part, claims that the new terms satisfy the Spens recommendations.

The alteration of fees twice within a single year reflects the difficulty of fixing a fair reward when payment is decided by each item of service. Three factors have to be assessed: the average time taken by each operation; the hours per week at the chairside; and the average ratio of professional expenses. In January the Minister set up a working party, under the chairmanship of Mr. W. Penman, to study timings; and the refusal of the dental organisations to discuss any change until the working party has reported accounts for the absence of negotiations over the new scales. As to chairside hours, the Spens Committee held that if these much exceeded 33 per week, efficiency would be impaired. The original scales were based on the assumption of this number of hours, though by its first cut the Ministry did nothing to discourage a somewhat greater number. With regard to expenses, the Ministry has accepted 52% as the appropriate proportion.

Perhaps the most difficult of these three factors to assess is the timing of each operation. In the payment of the general dental practitioner, as in the payment of his medical colleague, no allowance is made for special skill or special care; indeed in the case of the dentist a premium is placed on hasty and unconscientious work. Wherever payment for professional services is calculated by the average time for each item, anomalies will be found. With dentistry these anomalies could be ended if all were engaged at centres on either a full-time or a sessional basis. The dental organisations are believed to oppose such an arrangement; but it is hard to see how, in its absence, dental earnings can be fairly equated to other expenses in the National Health Service while doing justice to the careful worker. Meanwhile dissension is likely to continue.

1. *Lancet*, 1948, ii, 938.
2. *Ibid*, 1948, i, 802.

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B.C.G. VACCINATION REVIEWED

AT this moment, when the country is about to embark on tests of B.C.G. vaccine, we need a new statement on the present position of this form of vaccination, preferably written as a short pamphlet which busy people will have time to read. The memorandum [1] written by the Joint Tuberculosis Council in 1946 urging the Government to take up the matter was in some respects a piece of special pleading, and is in any case already out of date. A much longer exposition of the subject by Dr. Gerhard Hertzberg,[2] of Oslo, translated from the Norwegian text by Dr. Claud Lillingston, appears at an opportune moment. His book is the outcome of not only an extensive clinical experience but of an elaborate and careful system of record-keeping which was woefully lacking in some of the earlier publications on B.C.G. vaccination. Statistics relating to more than 13,000 cases are given, and the χ^2 test of significance is applied to all the groups. The whole work, in fact, is a model of combined clinical observation, careful recording, and statistical assessment; and now that Norway is committed to compulsory B.C.G. vaccination we hope that it will be extended to form a unique body of evidence.

For the investigation Hertzberg has used a new scheme of his own devising. All persons vaccinated were tuberculin-negative, and most of them in due course became positive after vaccination. The term "frequency of inversion" is used to indicate the percentage of persons found to be tuberculin-positive two months after vaccination. This is taken as a measure of the allergising capacity of the vaccine—i.e., "vaccination allergy." But later a person who has developed this allergic state may reinforce it or complete it with a natural infection of mycotuberculosis. For the resulting condition the term "superinfection allergy" is used, and inasmuch as bovine tuberculosis has now been eradicated from Norway, it necessarily implies hypersensitivity to the human type of bacillus naturally acquired in daily life. The B.C.G. allergy fades in the course of time and this natural superinfection hypersensitivity is assumed to have taken place when the tuberculin reaction, instead of becoming weaker, gets stronger, and remains stronger or at a higher level, during the period which follows. These facts are established by Hertzberg's systematic re-examination of the vaccinated person at regular intervals. At the same time a control group is constituted for those persons who, having been tuberculin-negative on first testing, become positive reactors before the intervention of protective B.C.G. vaccination. He classifies both these groups according to age, sex, and environment, and a special third group is added for nurses. The figures, assembled in an appendix of over 80 pages, are probably the fullest statistical record yet compiled for B.C.G. vaccination. Protection afforded by B.C.G. is greatest, Hertzberg thinks, when superinfection occurs during the first four years after vaccination. In this period the rate of failure of resistance was only just over 1%, whereas it was at least 7% when the superinfection was delayed to the fifth and sixth years. (No case of superinfection occurred after that.) He is careful to point out, however, that this difference in the rate of failure of resistance at various intervals between B.C.G. vaccination and natural superinfection is not statistically significant and that chance may have played a part.

In Oslo nobody is vaccinated unless he is Mantoux-negative to 1 mg. Old Tuberculin and has successfully passed a radiographic examination not more than three days previously. This date is readily established, but it is more difficult to gauge that of superinfection, and here the personal opinion of the examiner may possibly influence findings. Hertzberg rightly takes the view that B.C.G. is not a *virus fixe* as Calmette thought it was. If the virulence of the strain declines too much, immunity is obviously not achieved; if it increases, inoculation abscesses with very unpleasant results may follow. Moreover, it has been found that the vaccine must be used within 8 days; and it goes without saying that the tuberculin used for testing must be standardised above reproach. The most sensitive criteria for determining the virulence of the vaccine are held to be the size of the local reaction, the frequency of inversion, and the degree of tuberculin sensitivity on re-examination two months after vaccination. Finally it is recognised that some people are unusually sensitive to B.C.G. and it is not yet possible to recognise them in advance.

The reader of Dr. Hertzberg's book is left with no delusion about the importance of experience in the use of B.C.G.; it is essentially a task for the trained physician. Moreover, the facilities of a pathological laboratory and a properly equipped X-ray department are essential for success.

1. See *Lancet*, 1946, ii, 138.

2. The Achievements of B.C.G. Vaccination. Oslo: I Kommisjon Hos Johan Grundt Tanum Forlag. 1948. Pp. 224 + 86. 15 Kr.

ORIGINS OF DUODENAL ULCER

IT is nowadays widely conceded that in the ætiology of duodenal ulcer the patient's situation and his character are important. In a systematic search for these social and psychological factors Dr. Jurgen Ruesch [1] and a team of collaborators selected 42 men in the United States Navy, and 20 civilians, for study by means of interviews, psychological tests, and an autobiography. All the 62 subjects had a duodenal ulcer which had been demonstrated by X rays. The findings were compared with normal data, so far as these were available, and with the comparable findings in a group of men suffering from chronic diseases from which they were not recovering, "primarily for psychological reasons."

Accepting the close association between anxiety and ulcer to which other writers have drawn attention, Ruesch and his collaborators found that these patients with duodenal ulcer had had an unusual relationship with their parents, in that their father had not been the primary source of authority and ideals, and the mother the source of affection: consequently they had been driven, through frustration, to develop social techniques within their family—such as undue submission to a dominant parent—which they later applied, unsuccessfully, outside the family. They had usually been the youngest or the younger-born children in the family, and had been isolated from their brothers and sisters, but overprotected by their parents, until another child dislodged them from the privileged position. Their upbringing had made it difficult for them to express verbally their affection, anger, and love. They had not been able to learn, through trial and error, how to deal with other people. They could not tolerate any isolation, they put undue emphasis on prestige, and they tended to copy other people whom they took as models. Some admitted their hunger for affection and security; others denied it and counteracted their desires of this kind by great strivings for success and responsibility. "The striving of these patients did not constitute a sublimation of original drives, but, on the contrary, was a defence mechanism which must be considered as whitewash or patchwork to cover the real need for dependence. They carried their restlessness with them—constantly compelled to strive; as one goal was reached another goal was set further ahead and throughout a lifetime the patient could never relax because the ultimate ideal was never achieved." Their ambition led to more and more frustration, or to increasing responsibility and hostility from others, with eventual crisis. Culture

1. Duodenal Ulcer. Los Angeles: University of California Press. London: Cambridge University Press. 1948. Pp. 118. 22s. 6d.

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changes—e.g., from civilian life to the Navy, or from lower to middle class, or from European to American life—brought out these patients' difficulties in social adaptation. As in other psychiatric studies in war-time, it became evident that the civilians who had broken down had done so because of a more abnormal character structure, whereas the majority of the Service patients had broken down under the stress of a momentous situational conflict, but would probably have remained well under ordinary civilian conditions: the civilian patients had, of course, a different sort of situational problem and would have been largely excluded, by initial selection, from the Service group.

The attitude of the patients to their physician was also studied. This varied between a desire for authority or for an ideal personality, and a longing for affection, expressed in a wish for much personal attention. The last of these attitudes predominated in the subjects with most abnormal personality. Ruesch concluded that these patients were trying to reconstruct a situation of their childhood and that the benefit from treatment was partly due to the physician's having become a substitute for one of their parents. On the score of management, Ruesch concludes that the psychological side of the treatment should be introduced when the physical state has been improved and such symptoms as hyperacidity, constipation, and vomiting have been dealt with. Then the psychiatrist should by psychotherapy make the patient aware of his dependence and help him to mature so that he runs less risk of relapse through future collisions with his environment. This, however, is not a finding of Ruesch's investigation but a general inference: therapeutics did not enter into the study.

The care with which the inquiry was conducted makes this a valuable report; but it suffers, as all such studies must, from inadequacy of information about how common these traits and environmental troubles are in healthy people.

NOTIFICATION OF SCARLET FEVER

WHAT is to be done with dangerous carriers of disease parasites, and how can we make the best use of notification in the control of communicable diseases? These two important questions, raised by Dr. Madge's article in this issue, have long troubled epidemiologists. The episode described by Dr. Madge shows that our practice is faulty, not from lack of knowledge but from our being tied to a faulty conception of infectious disease. This is well exemplified by scarlet fever.

In the latter half of the 19th century scarlet fever was the most dreaded of infectious diseases, for it commonly carried a fatality of 10%. It was therefore included in the list of diseases notifiable under the Act of 1889. Nobody then doubted that it was a specific disease—that is, that the single causative organism, whatever it might be, gave rise only to scarlet fever. Since then research has proved that scarlet fever is due to hæmolytic streptococci, of which some 50 distinct types are known; though antigenically distinct, all are capable of producing the scarlet-fever reaction. The clinical characteristic of scarlet fever is the rash, which any streptococcus can cause; a rash due to one gives some immunity to a rash caused by different strains but no immunity to other reactions. Notification of scarlet fever is merely the notification of a rash, which may or may not be present in the course of streptococcal disease, and is therefore useless in preventive practice. Thus two schools of thought have arisen: one maintains that the notification of scarlet fever should be abandoned altogether, and the other that notification should be extended to embrace all streptococcal sore throats. The first view is supported by the triviality in these days of scarlet fever, which now has a negligible fatality and few complications; isolation is obviously useless, and the disease might be ignored except for individual severe cases, which in any event would receive treatment. The other school affirms that though scarlet fever is at present trivial it has been severe in the past and may become so again, and that the streptococcal sore throats which may arise from, or give rise to, scarlet fever are serious entities which call for control. This view is proving the more acceptable. In most States of the U.S.A. streptococcal sore throat is notifiable, while in New Zealand notification of scarlet fever has lately been replaced by notification of streptococcal sore throat. Most epidemiologists assert that this course should be adopted in Britain, but there is a difficulty: the criterion of streptococcal sore throat is the demonstration of a pathogenic streptococcus; this takes time and for epidemiological purposes the organism must be typed.

In effect the outbreak described by Dr. Madge was epidemiologically one of streptococcal infection originating from a patient with subacute rheumatism; and had this parent case been notifiable and notified the epidemic would probably have been prevented.

DETTOL MISTAKEN FOR BREAST-MILK

THE *B.P.* solution of chloroxylenol, which was introduced into medical practice as 'Dettol,' has been shown to be more powerful as an antiseptic than chlorocresol and remarkably non-toxic; it is now used very extensively in general surgery and midwifery, while in the home it has largely displaced other antiseptics. The manufacturers of dettol take some pride in their file of testimonials confirming its negligible toxicity. As must happen with any fluids habitually kept about the house, young children have drunk neat dettol from the bottle, and without any untoward effects. Now, however, an unlucky sequence of events in a Glasgow hospital has shown that the antiseptic can be poisonous if fed to premature infants.

A nurse placed a solution of dettol, in a bowl normally reserved for collecting breast-milk, on a table in the ward, mentioning to one or two patients that the solution was intended to refresh the atmosphere. Subsequently a pupil midwife collecting trays of breast-milk removed the bowl believing it to contain breast-milk. This is more readily understood when it is remembered that diluted dettol closely resembles human breast-milk and the nurse did not expect to find disinfectant on a ward table; moreover she was wearing a mask, and her sense of smell was poor because she had a cold. The contents of all these bowls were compounded in the formula room, and a mixture of milk and dettol was thus unwittingly prepared for the infants in the nursery. Three babies, aged 4, 7, and 31 days, and weighing 2·6, 2·2, and 1·4 kg., received their feeds through a Ryle's tube and succumbed in 12–22 hours despite prompt gastric lavage, repeated doses of niketamide, and continuous oxygen. A few minutes after receiving the mixture, 2 of the infants became cyanosed and dyspnœic; later the lungs became very moist and death was apparently due to central respiratory depression and cardiac failure.

At necropsy, the results of which are published by permission of the Procurator Fiscal and Dr. Andrew Allison, the lungs and stomach were found to be mainly affected.

CASE 1.—The greater part of the middle lobe and about three-quarters of the lower lobe of the right lung were atelectic; the left lung showed patches of atelectasis. The veins on the surface of the heart were engorged; all four chambers were full of blood; the heart was otherwise normal.

CASE 2.—Both lungs showed patchy atelectasis. A few petechial hæmorrhages were present on the external surface of the heart, which was otherwise normal. The odour of dettol was recognised when the abdominal cavity was opened. The stomach contained a small quantity of milk-curd; at the

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cardiac end the mucosa showed several small areas of congestion.

CASE 3.—There was partial atelectasis of both lungs. When the abdomen was opened a smell of dettol was observed. The stomach contained a small quantity of greenish grumous fluid; the mucosa showed several small erosions.

It is estimated that the volume of dettol received by the infants was 40–60 ml. of 5% solution, representing 2–3 ml. of dettol or 0·1–0·15 g. of chloroxylenol. Translated into comparable quantities given to an adult of 70 kg., the volume of dettol would be in the region of 88 ml., containing 4·4 g. chloroxylenol. Before administration, the milk-dettol mixture was boiled. This raises the possibility that one or more of the constituents of the dettol solution underwent partial decomposition. It is unlikely that simpler compounds of chlorine were produced by heating; and if they had been they would have been fixed by milk protein and mucoprotein, and by the plasma protein on absorption. Given neat, several of the other constituents of dettol solution (terpineol, alcohol, and caustic potash) would certainly produce serious local and constitutional disturbance in a baby—and particularly a premature infant—but only negligible amounts of these substances could have been present.

The most obvious lesson of this accident is that in exceptional circumstances the creamy white appearance of diluted dettol solution is a possible source of danger. After the event the hospital authorities promptly asked the manufacturers to supply a dye which would give the antiseptic a distinctive colour; suitable red, blue, and green pigments are available, and with them staining of the skin is minimal. The incident again illustrates the risk of departing from routine in nursing procedures which involve the use of potential poisons—in this instance the use of a disinfectant left on a ward table as a deodorant, and the use of a receptacle of distinctive type reserved for foodstuff.

POST-TRAUMATIC VASOMOTOR DISORDERS

IN the limbs trauma sometimes initiates changes which persist long after the original injury has healed. Thus simple infections, sprains, soft-tissue injuries, and fractures may precipitate a syndrome consisting in chronic pain, œdema, cyanosis, pallor, coldness, atrophy, bone changes, and muscle weakness. Any one of these sequelæ may dominate the picture; and confusion from preconceived mechanistic theories of its origin is reflected in the multitude of descriptive but inaccurate titles since Vulpian first termed the condition "trophoneurosis."

Shumacker and Abramson [1] describe examples of this syndrome under the title "post-traumatic vasomotor disorders." They record the late manifestations in 142 men serving in the U.S. army. In 58 of these the original injury was a soft-tissue wound; in the remainder it was one of a number of lesions such as simple or compound fractures of the small or long bones, sprains, crushing injuries, and infections. The foot was implicated in 111 cases and the hand in 31. The degree of violence in these injuries was unrelated to the nature and severity of the subsequent symptoms, which were most prominent in the injured limb but also involved occasionally the uninjured side. In 97 the leading symptom was pain, which was most commonly aching and less often throbbing or burning, and was usually aggravated by weight-bearing and activity. Other symptoms, in order of frequency, were swelling, cyanosis, coldness, hyperidrosis, numbness, and pallor; and the affected limb was always weak. Of 51 cases X-rayed, 42 showed generalised or spotty osteoporosis. In explanation of this syndrome, Shumacker and Abramson suggest that at first local tissue damage causes reflex vasomotor overactivity, on which later are superimposed the effects of disuse in patients loth to use a painful or abnormal extremity. Of their cases, 11 were thought to be basically neuropsychiatric problems, but even healthy stable soldiers quickly assumed the attitude and behaviour of chronic invalids. The relative importance of reflex vasomotor activity, disuse, and psychiatric factors is often difficult to evaluate, and the extent of physical disability is related rather to the interval between injury and treatment than to the severity of the original lesion.

In treatment the first step is to secure the patient's confidence and explain how disuse causes a vicious train of symptoms. Energetic active movement is the cornerstone of therapy, and for this the patient's coöperation must be obtained. Gentle massage and directed active and resisted exercises proved helpful, whereas passive exercises, manipulation, and whirlpool baths were disappointing. The œdematous limbs were given elastic support during the early stages. Of 95 patients treated by this method, 50 showed satisfactory results; of the remaining 45, 5 were not treated for long enough while 40 were not improved. Neuropsychiatric cases were also treated by hypnotic suggestion. Stellate-ganglion procaine blocks gave relief, especially where pain was not prominent. Sympathectomy was undertaken in 35 cases, most commonly, it seems, for the relief of persistent pain and ulceration. For the upper limb a modified Smithwick technique was used, and for the lower limb resection of the second and third lumbar ganglia.

In this country Jepson [2] has shown that with digital-nerve injuries followed by persistent pain and vasomotor overactivity there may be pronounced hyperalgesia of the deep tissues to pressure; and Kellgren and his associates [3] have found that the thermal pain threshold may be raised well above the normal 15°C. About half their patients had varying degrees of limb œdema; in some this was massive and persisted even after long-continued bed-rest and elevation of the limb. In most cases cyanosis was observed, and in many severe hyperidrosis; usually the affected limb was cooler than the uninjured, and in about half the cases the oscillometric readings were reduced. But many questions remain unanswered. Why do patients, who may have recovered normally from previous injuries, develop a syndrome of this sort? What are the mechanisms involved? Are local procaine infiltrations of the "trigger-point" as valuable as has been suggested,[4] and indeed is a "trigger-point" always detectable? What is the relationship between sympathetic overactivity and the pain? Further careful scrutiny and investigation are certainly required, and little progress will be made whilst such cases are facilely dismissed as malingerers, psychotics, and examples of compensation neurosis.

ANALGESIA IN CHILDBIRTH

ON May 23, the day before the second reading in the Commons of the National Health Service (Amendment) Bill, an amendment was tabled by Mrs. Leah Manning, Mr. Peter Thorneycroft, Lady Tweedsmuir, and Lady Megan Lloyd George, seeking to make it clear that a local health authority shall have a duty of securing that apparatus of a type approved by the Central Midwives' Board, facilities for transport, and drugs for the administration of analgesia to women who desire it during childbirth, are at all times available for midwives. The amendment has the same purpose as Mr. Thorneycroft's Bill which is now before the Standing Committee.

Mr. Thorneycroft said he would withdraw his Bill if the amendment were accepted at the committee stage, but Mr. Bevan was unable to give him any assurance.

1. Shumacker, H. B. jun., Abramson, D. I. *Surg. Gynec. Obstet.* 1949, 88, 417.
2. Jepson, R. P. Address to the Royal Society of Medicine, Feb. 2, 1949.
3. Kellgren, J. H., McGowan, A. J., Hughes, E. S. R. *Clin. Sci.* 1949, 7, 13.
4. Livingston, W. K. Pain Mechanisms. New York, 1943.

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Special Articles

SPEECH THERAPY

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CONSULTING SPEECH THERAPIST, GUY'S HOSPITAL

TWENTY-NINE years of private work in London, with twenty-three years in charge of the speech clinic at Guy's Hospital, provide reliable data as to the public demand for speech therapy. Such data may help those responsible for organising speech therapy in the National Health Service. Except for a few hospitals, speech therapy has hitherto been organised almost entirely by the county education committees, following the original lead of the London County Council, who also provide evening classes for adults.

At Guy's Hospital the speech defects observed and the time spent on them were:

Speech defect	*Percentage of cases*	*Percentage of time spent on them*
Backward speech	18·30	3·10
Stammering	62·69	74·52
Cleft palate and hare-lip	13·77	16·20
Sundry cases	5·24	6·18

There is always a tendency at hospital for the clinic to be used unnecessarily for simple cases of backward speech in children, most of which can easily be corrected by any school teacher. The great majority are seen only once for a few minutes; but a few cases of backward speech need special attention, either because the mother insists on a prolonged babyhood, with an appropriate limitation of speech, or because the child's refusal to speak is due to its desire to attract attention. In such cases plenty of common-sense suggestion and five or six instructions usually suffice.

The figures given above show stammerers take up three-quarters of the time in the clinic, and the figures given below make it clear, that any scheme that includes only children of school age will meet less than half the demand. They are also an effective answer to the statement so often made that the stammerer will grow out of it. No doubt a good many do grow out of it, but many do not.

It is often said that a stammer is caused by shock; but among all the Service cases that passed through the clinic at Guy's there was only one in which it began directly after a shock: in the others it was doubtless aggravated by strain, but it was there before the patient joined up.

The age-incidence and sex-distribution of stammering at Guy's Hospital was as follows:

Age	*Male*	*Female*	*Total*
4–16	35·90	8·09	43·99
17–19	11·12	2·54	13·66
20–29	27·41	2·76	30·17
30–39	6·71	1·40	8·11
40–49	2·51	0·52	3·03
50 or more	0·52	0·52	1·04
Total	84·17	15·83	100·00

The age-incidence and sex-distribution of stammering in private practice was as follows:

Age	*Male*	*Female*	*Total*
4–13	20·20	2·80	23·00
14–17	11·44	1·86	13·30
18–19	6·87	0·53	7·40
20–29	33·21	2·39	35·60
30–39	13·56	2·39	15·95
40–49	2·64	0·79	3·43
50 or more	1·32	0·00	1·32
Total	89·24	10·76	100·00

The figures in the hospital list in the age-groups 20–39 are almost doubled by the inclusion of Service cases in the recent war. Allowing for this, it will be noted that the tendency among hospital patients is to give up the struggle as soon as the sufferer has got a job. Thus in the age-groups 17–39, if the Service cases are disregarded, the total seeking help is about 33%, whereas in the age-groups 18–39 in private practice it is nearly 59%. The reasons are that fluent speech plays a more important part in professional than in manual work and that private patients have a longer education.

The larger percentage of female stammerers in hospital is probably due to the fact that all the hospital girls go to work, and a speech defect will hinder them from securing and holding a job. Among the people seen in private practice there is a tendency to concentrate on the education of the sons: the daughter who stammers is generally the one to stay at home, where her stammer will not prove any serious hindrance except to her happiness.

It is impossible to foretell how the educational and health schemes will develop, but comparison of percentages in hospital with those in private work gives some indication of the unsatisfied demand for the treatment of stammerers. The method I used is re-education of speech, with special attention to voice control. With this re-education full use is made of explanation, persuasion, and suggestion.

The sex-distribution of cleft palate and hare-lip, which amounted to 13·77% of cases at Guy's Hospital was:

Age	*Male*	*Female*	*Total*
4–16	35·71	33·34	69·05
16 or more	16·63	14·32	30·95
Total	52·34	47·66	100·00

The high proportion of patients under the age of 16 is due to the fact that surgeons sent their cases to the speech clinic for any advice that could be given—i.e., advice to the mother of an infant and a suggestion that the child should come back at the age of 5 or 6 years. Any patients fitted with a denture were sent to the clinic for advice how to make full use of the appliance. Many patients came up for occasional checking from infancy until their late teens.

"Sundry cases" listed above include hysterical aphonia, chronic laryngitis, and loss of speech from shock or stroke.

SUPPLY AND DISPOSAL OF SANITARY TOWELS IN SCHOOLS

REPORT BY THE MENSTRUAL HYGIENE SUBCOMMITTEE OF THE MEDICAL WOMEN'S FEDERATION*

THE Medical Women's Federation has long been interested in problems concerned with menstruation in schoolgirls: the London Association of the Federation published a survey in 1930,[1] based on over 6000 replies to a questionnaire addressed to schoolgirls.

Partly as a result of the findings of that survey, partly in response to a demand from doctors, teachers, and parents, the Federation has issued a leaflet on menstrual hygiene which appears to fulfil a real need. While this leaflet was being revised recently, several school medical officers suggested that its very simple recommendations were beyond the resources of many schools today. This, together with a number of accumulated queries from doctors and others, led the Federation to collect some facts about the facilities which were actually available in different types of schools. The report which follows concerns only a small number of schools, but it is thought that they represent a fair random sample. It is regarded

* The following members have served: ALICE BLOOMFIELD, F.R.C.O.G. (chairman); JOSEPHINE BARNES, F.R.C.S.; ANNIS GILLIE, M.R.C.P. (secretary); MARY HELLIER, M.B.; WINIFRED MORGAN, L.R.C.P.E.; DORIS M. ODLUM, M.R.C.S., D.P.M.; PATRICIA SHAW, M.D., barrister-at-law; GLADYS STABLEFORTH, M.D.; JESSIE C. B. SYM, M.D., D.P.H.; ALBERTINE WINNER, O.B.E., M.R.C.P.; Prof. MARY F. LUCAS KEENE, M.B. (ex officio).

1. *Lancet*, 1930, ii, 57.

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as a pilot investigation only, which may stimulate those responsible to review their provision and make the simple arrangements needed.

The aura of superstition and taboo which still surrounds the function of menstruation makes it difficult to obtain data on general standards of menstrual hygiene. The experience of the Women's Services during the second world war [2] shows that many young girls reached maturity with defective training. Endless trouble was encountered in persuading Service women to use the bins and wrapping paper provided, and the stowage of soiled towels behind pipes, in drawers, and down lavatories was one of the real trials of N.C.O.s and officers. The problem for schools has been sharpened by two factors. On the one hand there is the inclusion of the 14–15 age-group of girls by the raising of the school-leaving age; on the other, the displacement of the washable towel by one intended for immediate destruction has necessitated facilities for disposal.

METHOD OF INQUIRY

Bearing in mind the shyness, not to say prudishness, of the average schoolgirl about her reproductive functions, it was decided to try to get information on three aspects of the problem:

1. Facilities available for obtaining sanitary towels at the school.
2. Facilities available for changing towels while at school.
3. Methods of disposal of soiled towels employed by the school authorities.

It was decided to approach council schools in both urban and rural areas, and in Scotland as well as England and Wales. It was agreed that the school medical service was a proper channel of approach, so the coöperation was sought of the school health service group of the Society of Medical Officers of Health, through Dr. A. A. E. Newth, their hon. secretary, and Dr. Nora Wattie, assistant medical officer of health for Glasgow. They selected for the Federation a number of schools providing a fair cross-section of non-resident urban and rural schools of wide geographical distribution (excluding London), some mixed boys and girls. No special schools for physically or mentally defective were included. The total numbers from whom replies were received—and all those approached replied—were:

England	55
Scotland	53
Wales	4

The medical officers of these schools were approached by Dr. Newth and Dr. Wattie, and sent a simple questionnaire (see below) with the suggestion that the headmistress or senior mistress in each school might also be asked her views on the matter. A similar questionnaire was sent to the medical officers of 13 independent girls' schools, mostly of the type of good non-resident public schools. A modified questionnaire was sent to a few industrial concerns, as follows:

Government concerns	2
Large organisations	11
Small organisations	12

When the replies were received, they were analysed by Dr. Winifred Morgan.

QUESTIONNAIRE

(*a*) What provision is made for providing sanitary towels?
  (i) None.
  (ii) Available in charge of mistress or school nurse.
  (iii) Slot machine.
(*b*) What provision is made for changing sanitary towels?
(*c*) What provision is made for the children for disposing of sanitary towels?
  (i) None.
  (ii) Bins or containers of some kind.
  (iii) Destructor—chemical or fire.
  Is full use made of the facilities provided?
(*d*) Are any special arrangements made for the staff?
(*e*) Have you any special observations or suggestions to make?

RESULTS

The results of the inquiry are shown in the accompanying table.

Type of school	Method of obtaining sanitary towels			Facilities for changing sanitary towels			Methods of immediate disposal	
Council	None	From school nurse or teacher	Slot machine	Not specified	Ordinary lavatories	Special lavatories for seniors	None	Bins
England:								
Urban (43)	5	33	5	3	23	17	17	25
Rural (12)	7	5	0	7	3	2	9	3
Scotland:								
Urban (47)	19	28	0	30	10	7	41	3*
Rural (6)	0	6	0	None filled in this section			6	0
Wales:								
Urban (2)	1	1	0	1	1	0	1	1
Rural (2)	0	2	0	1	1	0	1	1
Totals:								
All schools (112)	32	75	6	42	41	26	75	43
Urban (92)	25	62	6	34	37	24	59	39
Rural (20)	7	13	0	8	4	2	16	4
Independent schools (13)	0	13	3†	0	12	1	0	13

* 3 gave other methods: 2 handing to school nurse, 1 to lady superintendent.
† 3 gave both methods.

The replies concerning the final disposal of towels are various and such that it is not possible to tabulate them. In most schools sanitary towels are burnt either in the school furnace or (method not specified) by the school nurse or cleaners. Only 1 uses chemical destruction; 3 have them burnt on an open fire in the headmistress's or lady superintendent's room: what happens in summer is not stated. None apparently use the individual incinerators. In 3 schools the wrapped towels are handed to the school nurses for disposal. Many schools comment that the bins are inadequate in number and several have had them on order for a long time. A remarkable finding is that quite a number of schools, including some large ones with young children of both sexes, have no lavatories with doors that lock.

The replies about facilities for staff are not altogether clear and have not been tabulated. Apparently staff cloakrooms are usually the only special provision made. Among the English urban schools 15, and of the independent schools 5, specify that bins are provided, and 1 independent school has slot machines.

The replies from industrial concerns show that all had satisfactory arrangements or were experimenting to ascertain what was the best. At any rate they were alive to the problem. As these results serve only to emphasise the backwardness of the schools, they will not be considered further.

DISCUSSION

These results do not make happy reading for women who remember their own childhood difficulties with menstruation. To adults who have learned to cope, this may seem much ado about little or nothing, but for the girl going through the adjustments of puberty, often with inadequate health instruction, it is far from trifling. Lack of facilities for obtaining towels may cause great misery when, as so often happens during the first years after the menarche, regularity is not yet established and a girl is caught short. But of even more importance to her are adequate facilities for changing, and here there are two sources of distress. Wearing a towel too long causes chafing and soreness, with associated discomfort

2. Winner, A. L. *Publ. Hlth*, 1947, **60**, 232.

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and pain on walking and running; moreover, inability to change when it is known to be necessary sets up an anxiety that may be a panic fear, lest soiling of underwear becomes staining of outer clothes.

It is therefore disturbing to find that of the 112 council schools which replied, 32 have no arrangements whereby children can obtain sanitary towels, and 42 have no facilities for changing. It is even more disquieting that of the English rural schools more than half have no such facilities and, apparently, none of the 6 approached in Scotland. When it is remembered that these are the very schools whose pupils have to travel long distances, sometimes on foot, the position can hardly be viewed with equanimity, even if, as seems unlikely, the relatively small number of rural schools should chance to be an unrepresentative sample.

If it is accepted that some means of obtaining towels is desirable, there is much to be said for putting the stock in charge of the school nurse or games mistress, provided that it is accessible at all times. A powerful deterrent to taking exercise is painful chafing even among those who are anxious to take part, and to the others unobtrusive instruction in menstrual hygiene can be given at a time when it is most likely to be acceptable. The ancient superstitions about not bathing or joining in sports and games can be countered. Few schools seem to have slot machines and most school medical officers do not seem to care for them. Probably this type of provision is better suited to adults than to children. There seems no reason why children should not pay a few pennies for their towels, though several schools state that they provide them free, and in one case the headmistress pays for them out of her own pocket.

Disposal is a relatively new problem. Up to fairly recent years, nearly all women who used any form of protection, and many poorer women apparently used none,[3] wore washable articles made of turkish towelling. The soiled towels were taken home to be washed and mass disposal did not arise. Of late years, however, more and more women have taken to wearing pads made of cotton-wool or cellulose, which are softer, more comfortable, and more hygienic, though appreciably more expensive. They have to be disposed of, preferably by burning. It is said to be possible to flush some down the lavatory, but experience shows that they are apt to block the drains.

In the home disposal usually presents no difficulty, but mass disposal in factories, offices, Service units, and schools raises administrative problems. Various methods exist: the simplest, and that in widest use, is to provide covered bins in the women's cloakrooms in which wrapped soiled towels can be placed and collected at intervals, usually by the cleaners, to be burnt in a furnace, boiler, or incinerator. This method is well suited to schools. There are also various forms of individual incinerators, gas or electric, in which single wrapped towels are immediately destroyed in a small apparatus placed in the washroom or lavatory. These are extensively used in nurses' homes and some factories and were successfully installed in small Service units. Some can, however, easily be overloaded and for various reasons do not seem suitable for schools. Finally, there are various methods of destruction by disintegrating chemicals: they are said to be effective, but many authorities are nervous of using powerful, often caustic, solutions with untrained staff, and this would seem to apply even more forcibly to schools.

With all these possibilities available, it seems inexcusable that 75 of the 112 schools have neither bins nor any other method of immediate disposal. Only 16 give any method of final disposal, though presumably the 43 possessing bins must all have some means of getting rid of their contents. It does not seem hygienically desirable for children to have to transport soiled towels home for destruction in an attaché case used for food and school-books. The provision required is simple: covered bins, wrapping paper, and a furnace. The handing of wrapped towels to the games mistress or school nurse does not seem a good idea. The remarkable procedure of burning the towels on an open fire in the headmistress's room seems to combine the worst of all possible worlds. There is a shortage of bins at the present time, but this should soon right itself; in any case the public interest demands that a sufficient supply should be available for the home market.

A surprising point that has emerged from these inquiries is the number of schools that do not have lavatories that lock, so that the older girls can have no privacy in which to change their towels. Even more disturbing is the fact that some of these schools (and large ones at that) have common lavatories, with swing doors, for older girls and for juniors and small boys. This seems sheer cruelty to the sensitive adolescent and should not be tolerated anywhere.

The provision for women staff in many schools appears to be inadequate and needs improvement. It is felt, however, that they can and should speak for themselves, and that the urgent need is for the children. The contrast between the deficiencies of the council schools and the reasonably adequate provision of the independent schools cannot be regarded with satisfaction.

The situation uncovered by this investigation can only be regarded with concern, and those responsible must all take part in improving it. Parents, school medical officers, headmistresses, games mistresses, and school nurses must all take steps to get the matter dealt with. It may well be that there has been a lack of awareness of the very existence of a problem; the women concerned have forgotten the tribulations of their own childhood, while the men do not easily realise the importance of the matter. It certainly appears from the replies that women doctors are more alive to the deficiencies, though they have great difficulties in getting them remedied. Be that as it may, the schools must not be allowed to lag behind progressive industrial and Service practice. This report has been written in the hope that it may direct the attention of the medical and teaching professions to a serious, but easily remedied, deficiency.

SUMMARY

An investigation has been carried out into the facilities available in schools for the supply and disposal of sanitary towels.

Replies obtained from 112 council schools showed that 32 had no means whereby the children could obtain towels; that 42 had no facilities for the changing of towels; and 75 had no means of disposing of soiled towels. The situation is worse in rural than in urban schools, though here the need is greater.

For 13 independent schools arrangements were reasonably satisfactory.

A limited survey of industry showed an awareness of the problem and attempts to solve it.

Provision of a similar kind for women staff in schools also seems inadequate.

The amount of discomfort and psychological unhappiness caused to the adolescent by inadequate provision is stressed, and the simplicity of the arrangements needed is pointed out.

The federation wish to acknowledge the help given by Dr. A. A. E. Newth and the committee of the school health group of the Society of Medical Officers of Health, and by Dr. Nora Wattie. The federation also wishes to thank Dr. Winifred Morgan for analysing the replies, and all the school medical officers who replied to this questionnaire.

3. Women's Group on Public Welfare. Our Towns—a Close-up. London, 1943.

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FACTORY MEDICAL SERVICES

SURVEY OF ARRANGEMENTS

A SURVEY has lately been made of factory medical services in Great Britain. Table I indicates the extent to which various kinds of medical service are being rendered in factories of different sizes. Table II shows the number of doctors involved, subdivided according to whether they hold appointments under the Factories Act, and roughly according to the proportions of their time which they spend on such work. A single factory may of course be included opposite several, or even all, of the items in the first column of table I.

Statutory examinations of young persons for certificates of fitness, which are compulsory in factories generally, have been left out of account for the purposes of table I, but the time spent on them by doctors is taken into account for the purposes of table II. On the other hand, periodical medical examinations of particular groups of workers in employments with special health risks have been taken into account in table I, whether legally compulsory or not. Table II does not include: (*a*) 15 Medical Inspectors of Factories; (*b*) members of the pneumoconiosis panels (about 25 doctors) on the staff of the Ministry of National Insurance; or (*c*) doctors engaged in medical research who do not visit factories except in connexion with their research work.

Small Factories.—In table I the figure for item 3 (*c*) (periodical medical examinations) is largely accounted for by the fact that many small factories have compulsory medical examinations for chrome-plating workers. As regards the other figures, the small factories in question are very largely either (*a*) small factories of large industrial concerns whose medical services cover their small works as well as their large ones, or (*b*) small factories of commercial concerns with medical services for their staffs generally.

Group Services.—There appear to be only three instances at present of schemes of factory medical services for groups of small independent factories, as distinct from groups of factories run by large or closely associated concerns. These three instances are at the trading estates at Slough, Bridgend, and Hillington. The Slough scheme covers 113 factories, of which 33 employ less than 26 workers; the Bridgend scheme covers 39 factories, of which 15 employ less than 26 workers; and the Hillington scheme covers 126 factories, of which 69 employ less than 26 workers, but the services rendered in 10 of the factories seem to be more comprehensive than in the others. The services rendered by these centres are included in the figures in table I.

Industries.—The Factory Inspectors who made the inquiries were asked whether, in their districts, there are any industries which predominantly stand out as having factories with arrangements for medical supervision beyond legally compulsory medical examinations. The replies in most cases were in the negative; but, taking the country as a whole, the following seem to be prominent: dockyards and other factories occupied by the Admiralty, Royal Ordnance factories, aircraft industry, shipbuilding, iron and steel manufacture, metal-tube industry, chemicals (particularly at factories occupied by Imperial Chemical Industries Ltd.), tobacco and cigarette industry, electric cables and large electrical manufacturing undertakings, and cotton-spinning. The returns do not cover the special medical centres for dock workers established at some important ports; the services rendered at those centres are of a somewhat different character from ordinary industrial medical services.

TABLE II—NUMBER OF DOCTORS WITH WHOM ARRANGEMENTS HAVE BEEN MADE FOR FACTORY MEDICAL SERVICES (GREAT BRITAIN)

Amount of time given by the doctor, including statutory and non-statutory services	Doctors holding appointments as appointed factory doctor (or appointed surgeon)	Doctors who are not appointed factory doctors
Whole-time	53	186
Substantial (say, more than 12 hours a week on average)	94	111
Moderate (say, 3–12 hours a week on average)	245	406
Occasional (say, 3 hours or less per week)	1397	584
Totals	1789	1287

Examinations and Miscellaneous Services.—Cases included under item 3 (*f*) (examinations of workers returning after illness) often include only medical examination after substantial illness or interviewing by a nurse.

The "other kinds" of medical service (item 3 (*g*) of table I) mentioned by the inspectors are very miscellaneous; some of them are given at some factories and some at others, so the figures for that miscellaneous item do not indicate the extent to which any particular kind of service is given. Moreover, some of the inspectors appear to have included cases in which the service is really only incidental to the ordinary medical services, but is rendered by some doctor or organisation other than the factory doctor—for instance, X-ray or blood examinations in special classes of case. The special services mentioned include optical services, dental services, chiropody, physiotherapy, artificial sunlight, infra-red and other treatments of that kind, mass-radiography, supervision of firms' day-nurseries (cotton), special supervision of European volunteer workers, examinations in connexion with apprenticeship schemes, examinations of persons joining pension schemes, and arrangements for sending workers to a "rest-break" centre.

TABLE I—FACTORIES WITH MEDICAL SERVICES OTHER THAN STATUTORY EXAMINATION OF YOUNG PERSONS FOR CERTIFICATES OF FITNESS (GREAT BRITAIN)

—	No. of workers					Total
	<26	26–50	51–100	101–250	> 250	
1. No. of factories	202,868	18,207	10,475	7335	4884	243,769
2. No. of factories with definite arrangements for medical services (other than statutory examinations of young persons) of one or more of the kinds indicated in 3	845	453	433	750	2018	4499
Percentage of line 1	(0·42)	(2·48)	(4·13)	(10·23)	(41·32)	(1·85)
3. Kinds of medical services in the factories in 2:						
(*a*) General medical supervision over health of employees, including study of sickness records, working conditions, and advice to the firm on questions of factory hygiene	230	137	223	418	1517	2525
Percentage of line 1	(0·11)	(0·75)	(2·13)	(5·70)	(31·06)	(1·04)
(*b*) Supervision of first-aid or ambulance-room services	261	145	220	391	1494	2511
(*c*) Periodical medical examination (whether compulsory or not) of particular groups of workers—e.g., those in employments with special health risks	545	297	200	311	921	2274
Percentage of line 1	(0·27)	(1·63)	(1·91)	(4·24)	(18·86)	(0·93)
(*d*) Periodical medical examination of all workers:						
(i) at the factory	27	13	20	50	119	229
(ii) at the doctor's surgery	4	1	4	3	6	18
(*e*) Examination of new entrants and applicants for employment:						
(i) at the factory	76	71	124	253	1034	1558
(ii) at the doctor's surgery	76	17	20	32	80	225
(*f*) Examination of workers returning after illness:						
(i) at the factory	46	46	83	184	800	1159
(ii) at the doctor's surgery	68	7	11	21	34	141
(*g*) Other kinds except statutory examinations of young persons	48	36	69	119	465	737

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GRADING OF HOSPITAL STAFFS

IN a letter to regional boards and to boards of governors, the Ministry of Health suggests that, when each professional reviewing committee has completed its task of grading individual practitioners, the doctors concerned should be notified at once of their grade, even if the board is not yet in a position to offer a permanent contract. "Indeed, it is desirable to expedite notification and any subsequent further review as much as possible so as to enable permanent contracts to be offered."

Boards are advised at the same time to make clear to the doctor

"that if he disagrees with the Board's grading it is open to him to ask the Board for reconsideration and to put in any statement of his reasons for so doing additional facts of which he thinks the reviewing committee may have been unaware. Where any such appeal is made the Board should ask the reviewing committee to reconsider the case, and to inform the Board whether they reaffirm or vary their previous recommendation. If the previous grading is reaffirmed the Board, in informing the appealing practitioner, should point out to him that he is not precluded from applying in future for a post of higher grading, and (in the case of specialist appointments) if he applies for such a post in the future his application will be considered afresh by the advisory appointments committee set up in accordance with the requirements of the Act and regulations in connection with the individual vacancy, and his chances will not be prejudiced by his grading at the present time."

Boards are reminded of the Minister's view that where plans for offering permanent contracts on a revised basis of allocation of duties involve displacement or serious disturbance of consultant staffs, he has a moral obligation for seeing that the staff displaced or disturbed are given as far as practicable the opportunity of undertaking similar duties elsewhere—an obligation which he can meet only through the boards themselves. When they themselves have difficulty in finding an alternative post, boards of governors are urged to seek the coöperation of neighbouring regional boards, whose administrative control extends over a broader field.

PAY INCREASES FOR TRAINED NURSES

INCREASED salaries for ward sisters, charge nurses, staff nurses, and enrolled assistant nurses employed in general hospitals have been announced by the Nurses and Midwives Whitley Council. The increases apply from Feb. 1, 1949. A review of the salaries of comparable grades in all other hospitals in the National Health Service, including mental nurses and midwives, will follow; all increases will operate from Feb. 1.

The new salaries will be inclusive, and resident nurses will pay for board and lodging; income-tax will be related to the inclusive salary. The new rates per annum are as follows (previous rates in England and Wales, including the value of board and lodging, are also shown):

Women	*Previous rates*	*New rates, gross salary*
Ward sister:		
Cash salary	£180–260	£375, rising by 7 annual increments of £15 and 1 increment of £20 to £500
Value of emoluments	£120	
Staff nurse:		
Cash salary	£140–200	£315, rising by 8 annual increments of £12 10*s.* to £415
Value of emoluments	£100	
Enrolled assistant nurse:		
Cash salary	£120–170	£285, rising by 8 annual increments of £12 10*s.* to £385
Value of emoluments	£100	

Men	*Previous rates on non-resident basis*	*New rates*
Charge nurse	£312–380	£385, rising by 7 annual increments of £15 and 1 increment of £10 to £500
Staff nurse	£260–312	£325, rising by 8 annual increments of £12 10*s.* to £425
Enrolled assistant nurse	£239–291	£300, rising by 8 annual increments of £12 10*s.* to £400

Nurses who are resident will pay £120 per annum (ward sisters and charge nurses £130) for board and lodging and other services provided by the hospital. Non-resident nurses will pay £20 per annum for meals on duty and the use and laundry of uniform.

The total number of nurses and midwives employed full-time in the hospital service throughout England, Wales, and Scotland is about 125,000. The Whitley Council has now dealt with the salaries of close on 100,000. The rates for part-time nurses have not yet been determined.

REDUCTION OF DENTISTS' FEES

FROM June 1 a new scale of fees payable to dentists under the National Health Service is to be introduced, with the aim of reducing gross earnings by 20%. The cut of 50% in gross earnings beyond a rate of £400 a month will be brought to an end on July 31, six months after its introduction.

A memorandum issued last week by the Ministry of Health explains that the new scale, which should enable dentists to earn a net income of not less than £1778—a figure that accords with the Spens Committee's recommendations—will be reviewed in the light of the report of a working party that has been set up to study the timings of dental operations.

The memorandum includes an analysis of earnings by 5078 dentists in the service between October, 1948, and March of this year. The figures are:

No. of dentists	*Gross earnings*	*Net earnings (assuming 52% practice expenses)*	*Net earnings plus 8% for superannuation*
	£	£	£
209	0–1200	0–576	0–622
712	1201–2400	577–1152	623–1244
1128	2401–3600	1153–1728	1245–1866
1122	3601–4800	1729–2304	1867–2488
841	4801–6000	2305–2880	2489–3110
479	6001–7200	2881–3456	3111–3732
254	7201–8400	3457–4032	3733–4354
333	Over 8400	Over 4033	Over 4354

All assistants are counted and included. The table takes no account of the limitation of earnings above £4800 a year gross imposed in respect of payments made on and after Feb. 1, 1949.

The memorandum points out that of the 5078 dentists covered by the table, about 59% were earning from the National Health Service at an annual rate above that based on the Spens Committee's recommendations, and 41% below that rate. "While there is no precise information as to the amount of private practice it seems reasonable to assume that additions to the amounts shown are earned from private fees by dentists in at any rate the lower income categories."

Under the proposed new scale, the fee for examination and report is reduced from 10*s.* to 5*s.*; the fees for general anæsthetics are unaltered. The present and the new scales are:

	Present scale	*Proposed scale*
	£ *s.* *d.*	£ *s.* *d.*
Examination and report	10 0	5 0
Scaling	16 6	12 6
Fillings: minimum	1 0 0	15 0
maximum	1 17 6	1 7 6
Root treatment: minimum	2 0 0	1 10 0
maximum	3 0 0	2 5 0
Extractions: 1 or 2 teeth	10 0	7 6
3, 4, or 5 teeth	15 0	11 6
6, 7, or 8 teeth	1 0 0	15 6
9, 10, or 11 teeth	1 5 0	19 6
12, 13, or 14 teeth	1 10 0	1 3 6
15, 16, or 17 teeth	1 15 0	1 7 6
18, 19, or 20 teeth	2 0 0	1 11 6
Over 20 teeth	2 7 6	1 17 6
General anæsthetics: 1–3 teeth	10 0	10 0
4–11 teeth	1 0 0	1 0 0
12–19 teeth	1 10 0	1 10 0
20 or more teeth	2 0 0	2 0 0
Dentures: full upper and full lower	10 10 0	9 9 0
1, 2, or 3 teeth	4 17 6	4 5 0
4–8 teeth	5 15 0	5 0 0
9–14 teeth	6 1 6	5 7 6
Repairs: minimum	18 0	15 6
maximum	2 0 0	1 15 0
Crowns: minimum	4 7 6	3 17 6
maximum	9 7 6	8 5 0

The new scale is discussed in an annotation on p. 921.

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MEDICAL AUXILIARIES IN THE HEALTH SERVICE

THE Minister of Health and the Secretary of State for Scotland have set up eight committees to review questions of recruitment, training, and qualifications of medical auxiliary workers in the National Health Service. All the committees will be under the chairmanship of Mr. V. Zachary Cope, F.R.C.S., a former president of the Board of Registration of Medical Auxiliaries. Dr. G. A. Clark, a principal medical officer of the Ministry of Health, and Mr. A. B. Taylor, an assistant secretary of the Department of Health for Scotland, will also sit on all the committees. Other members of committees are:

Almoners.—Dr. F. Grundy, Miss M. M. McInnes, and Miss M. J. Roxburgh.

Chiropodists.—Mr. St. J. D. Buxton, F.R.C.S., Miss D. Grant Nisbet, Miss C. F. Norrie, and Dr. J. A. Scott.

Dietitians.—Miss M. C. Broatch, Prof. S. J. Cowell, F.R.C.P., Dr. D. P. Cuthbertson, Dr. George Graham, and Miss R. Pybus.

Laboratory Technicians.—Mr. T. C. Dodds, Mr. A. Norman, and Prof. G. S. Wilson, F.R.C.P.

Occupational Therapists.—Miss M. D. Barr, Miss E. M. Macdonald, Mr. L. W. Plewes, F.R.C.S., and Dr. T. P. Rees.

Physiotherapists.—Mr. J. T. Buchan, Mr. J. H. C. Colson, Dr. J. L. Livingstone, Miss M. I. V. Mann, Miss M. U. Sharpe, Mr. T. T. Stamm, F.R.C.S., and Dr. W. S. Tegner.

Radiographers.—Dr. S. Cochrane Shanks, Prof. G. Stead, D.SC., Mr. C. Lovell Stiles, Mr. R. White, and Prof. B. W. Windeyer, F.F.R.

Speech Therapists.—Dr. E. J. Boome, Dr. J. B. Gaylor, Mr. V. E. Negus, F.R.C.S., and Dr. C. C. Worster-Drought.

The secretary of all the committees is Mr. J. G. Paterson, Ministry of Health, Whitehall, London, S.W.1.

GENERAL MEDICAL COUNCIL

OPENING the 175th session of the council on May 25, Sir HERBERT EASON, the president, spoke with deep regret of the death of Dr. J. W. Bone (a treasurer since 1939), and Mr. Edward Sheridan (formerly chairman of the dental education and examination committee).

At the end of 1947, said the president, the Medical Register contained the names of 77,929 practitioners, of whom 67,261 were registered on qualifications granted in the British Isles, 6509 (including 813 temporarily registered) in the Commonwealth list, and 4159 (including 3748 temporarily registered) in the foreign list. The number of names added or restored to the register in 1948 was 3984—the highest number on record. But at the end of the year the number of names in the register (76,292) was 1637 less than at the end of 1947, and exactly the same as at the end of 1946. Under the Medical Practitioners and Pharmacists Act, 1947, though the names of 1396 practitioners were added to the foreign list, the names of 4467 were removed from the register on the determination of their temporary registration. Of these, 3119 had not applied for normal registration within the statutory time-limit, and it could safely be assumed that most of them were practitioners from the Commonwealth or from the United States who have returned to practise at home. "I am sure that the council would wish me to take this opportunity of saying that the arid details of registration and removal from the register do not obscure for us the immeasurable self-sacrifice and devotion of these medical men and women who joined the ranks of their colleagues here when the need was dire."

The executive committee, continued the president, were gratified to report that the law regulating medical practice in Saskatchewan was amended on March 31 by an Act designed to afford to the registered medical practitioners of the United Kingdom privileges of practising in the Province which would justify the reinstatement of the reciprocal relations established between the Province and the United Kingdom in 1916 but brought to an end in 1926.

> "If, as the Committee hope and believe, Saskatchewan is thus soon to be added to the four Canadian Provinces—Alberta, Manitoba, Nova Scotia, and Prince Edward Island—between which and the United Kingdom reciprocal relations exist, they cherish the further hope that the way may be opened to the resumption of such relations with New Brunswick, Ontario, and Quebec, with which they formerly existed, and to the establishment of such relations for the first time with British Columbia."

The council, he added, have not departed from the aspirations they expressed as follows nearly twenty years ago:

> "The council, regarding the matter from the professional and scientific point of view, desire that there should be regulated freedom for British practitioners, in the widest sense of the term, throughout the world, or that, at all events, this freedom should subsist throughout the Empire. They would gladly do anything in their power to promote a satisfactory arrangement which would meet the views of the Dominion authorities, and at the same time provide an equitable basis upon which the matter might be settled."

Medicine and the Law

"M.D. BLN"

As he finished delivering the important judgment of the full King's Bench court in Younghusband *v.* Luftig on May 17, the Lord Chief Justice declared that the cases on section 40 of the Medical Act were "in a complete fog." The court "thought that the time had come when the position might be clarified by further legislation." There is probably a poor prospect of the Government whips encouraging Parliament to discuss the improvement of the Medical Act; meanwhile one wonders why the judges themselves cannot clarify the confusion of the judge-made law.

The facts in the Luftig case were as follows. The defendant, having obtained a doctorate in medicine in Berlin in 1913, became a naturalised British subject in 1938. His name has never been placed on the Medical Register. He did not apply for registration under the Medical Practitioners and Pharmacists Act, 1947; perhaps indeed he could not have qualified as a "foreign practitioner." Though unregistered, he practised successively in London, Northampton, and, since 1944, in Brighton. At Brighton he described himself on his plate and notepaper as "M.D. BLN"; "BLN" was an abbreviation of Berlin; he gave up using the full word because he had received threatening letters and had swastikas marked on the wall of his house. He informed his patients orally or in writing that he was not on the British Medical Register and that he held a Berlin degree.

Unregistered practice is, of course, in itself no crime whatever, but it is an offence under section 40 of the Medical Act if anyone

> "shall wilfully and falsely pretend to be or take or use the name or title of a physician, doctor of medicine . . . or any name, title, addition or description implying that he is registered under this Act. . . ."

The question in the recent case was whether Dr. Luftig (who never employed the description "M.D." without adding either "Berlin" or "BLN") had brought himself within section 40 by his use of "M.D. BLN." The Brighton justices said he had not. The King's Bench judges refuse to interfere.

It is common knowledge that there are, or have been, "bogus concerns"—to use Lord Goddard's expression—"masquerading as universities which sell bogus degrees." If a man, possessing no better qualification than a doctorate bought from some such commercial concern, called himself a doctor of medicine, the courts would know how to deal with him. But nobody suggested that Dr. Luftig's degree was other than genuine. That being so, if he called himself "M.D. Berlin," he com-

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mitted no offence; he was merely describing himself as what he was. (The facts indeed, if one may interject the comment, were not unlike those in Ellis *v.* Kelly where Baron Wilde remarked: "The defendant had a German diploma which he might reasonably believe entitled him to describe himself as he did." Mr. Justice Humphreys, during the hearing of Jutson *v.* Barrow in 1936, commented that it was hard to understand why Mr. (or Dr.) Kelly was ever prosecuted.) To return, however, to Dr. Luftig's case, the real difficulty was his use of the abbreviation "BLN." But, said Lord Goddard, it was for the Brighton justices to decide whether he was "wilfully and falsely" pretending to take or use the name or title of a doctor of medicine; their decision was that he did not do so.

Then came the further point—had Dr. Luftig used a description "implying that he was registered"? Counsel argued against him that the title of "doctor of medicine" could only be used by a person who was registered.

In Jutson *v.* Barrow, where Captain Horace Barrow, having had no professional training, displayed the description "manipulative surgeon" and seemed to assert that the word "manipulative" was chosen in order to distinguish him from duly qualified surgeons whose names were on the Register, Lord Hewart said that the words "implying that he is registered" were not words describing the individual's intent but describing the effect. "The section is to protect the public, and what is regarded is not the mind of the individual but the meaning likely to be conveyed by the words that are used."

In the Luftig case Lord Goddard emphasises the significance of "wilfully and falsely" in section 40. *Mens rea*, the guilty mind, is an element in the offence, "and the presence or absence of that state of mind must be tested on ordinary principles and in the light of common sense." Lord Goddard rejected counsel's contention that "doctor of medicine" could be used only by a person who was registered. He also rejected an alternative contention that the Medical Act at least prevented a man from using the title unless he was qualified to be registered; the court could find no basis for this argument in the statute. The cardinal fact was that the justices had found that the description "M.D. BLN" did not imply that Dr. Luftig was registered. They could, said Lord Goddard, have decided the other way. They had found that Dr. Luftig had not acted wilfully and falsely; it could not be said that there was no evidence to support this finding; the appeal against their finding must therefore be dismissed.

In the "complete fog" of cases under section 40 one point seems clear. If an unregistered practitioner really wishes to avoid confusion with registered practitioners, he can find means of doing so. "BLN" is not a familiar abbreviation of Berlin; to avoid the threatening letters and the swastikas some hieroglyphic was presumably sought which would not suggest Berlin very readily. Whatever "BLN" may convey to the uninitiated, the Lord Chief Justice remarked that "it was to be hoped that Dr. Luftig would not in future use that abbreviation."

Public Health

A RURAL OUTBREAK OF SCARLET FEVER
DUE TO A NON-NOTIFIABLE CARRIER

FRANK T. MADGE
M.D. Lpool, D.P.H.
MEDICAL OFFICER OF HEALTH TO THE COMBINED COUNTY DISTRICTS OF WESTMORLAND

A MILKER and roundsman with chronic subacute rheumatic fever was responsible for an epidemic of hæmolytic streptococcal infections during the spring and summer of 1948 in a small remote village of the English Lake District. There were 13 clinical cases of scarlet fever and 12 reported cases of other streptococcal illnesses.

The epidemic was interesting for two reasons: first, limitation of the infection to this village and its visitors; and secondly, the difficulty of controlling a non-notifiable carrier of a notifiable disease.

The outbreak occurred in four separate phases:

1. The initial illness of the milker in January, 1948, and other reputed cases of tonsillitis in the village.

2. A probably milk-borne spread in early April, with 7 cases of clinical scarlet fever and 4 cases of other suspicious infections.

3. The third phase, which occurred in May, was also probably milk-borne, comprised 4 cases of notified scarlet fever and 4 cases of suspicious infections, and was limited to persons who did not adopt the precautions advised.

4. The fourth phase was in July, consisting of 3 cases of notified scarlet fever and 1 case of tonsillitis, possibly milk-borne or possibly by direct contact.

The farm was a small one, about half a mile above the village, and the dairy herd was limited to five cows in milk. The shippon was dark, low, and old-fashioned, with cobbled floors, and a barn overhead. A portion of the farmhouse was used as a dairy and technique was primitive. The water-supply was surface drainage. The milk-supply was confined to the local village, and the milk was retailed loose. The adverse effect of these conditions was reflected in the bacterial content of the milk, and the stage was set for the advent of trouble.

The milker was a member of the family living in the farmstead and certainly intermittently infected one, if not all, of the other occupants, who were apparently non-susceptible. The family also let a portion of the farmhouse for board-residence to holiday visitors, several of whom were infected.

THE FIRST PHASE

The milker and roundsman, aged about 23, developed a severe sore throat in January, 1948, but there was no rash. He made rather a slow recovery from this illness, and his convalescence was complicated by polyarticular synovitis and muscular pains. He resumed work on the farm but could walk only with difficulty and was obviously suffering considerable discomfort. He continued in this state of malaise for about three months and did not obtain real relief until the warmer weather arrived about midsummer.

There had been many sore throats in the village since Christmas, but no serious case was traced, and there had been no notification of scarlet fever for many months.

THE SECOND PHASE

CASE 1.—A man, one of a party of five adults and five children who had arrived in the village on March 25 and taken a furnished house next to the farm, fell ill on March 29 and went next day to Batley, where he was found to have scarlet fever.

CASE 2.—A girl, aged 6 years, daughter of case 1, developed scarlet fever on April 4, whereupon the rest of the party left the district next day.

As no other cases of scarlet fever had been notified in the district, it was felt that the father had probably brought the infection with him, and that the daughter, being a close contact, had been infected by him.

CASE 3.—In the village a girl, aged 4 years, developed a high temperature on April 8 and a scarlatinal rash on April 9.

Since a maid from the furnished house where cases 1 and 2 had occurred had visited this patient's home on

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March 31, it seems possible that this child had become infected from the holiday party; but eight days from contact to onset appeared rather long.

CASES 4 and 5.—On April 14 a letter was received from the medical officer of health of Croydon reporting that 2 young women had returned home after a holiday in the village and had been admitted to hospital on April 10 and 12 with scarlet fever.

These young ladies had volunteered the information that the village milkman had a sore throat. This disclosure considerably shortened the investigations. It was found that the source of the milk-supply was identical in cases 1–5. The farm was visited and the milker and roundsman was questioned and examined. He denied any recent recurrence of tonsillitis, but his tonsils were dirty. From a throat-swab the laboratory reported the presence of group-A hæmolytic streptococci, subsequently ascertained to be type 25 by the streptococcal reference laboratory of the Central Public Health Laboratory, London. The other members of the farm household were examined and found to be healthy.

On April 15, by a notice issued under Article 19 of the Milk and Dairies Regulations, 1926–43, the carrier was prohibited from taking part in dairying. The milk cows were found to be free from mastitis by the divisional veterinary inspector of the Ministry of Agriculture and Fisheries. Bulk samples of milk were taken and, though there was a profuse growth of contaminants, no hæmolytic streptococci were isolated. All householders on this milk-round were visited and warned to boil all milk.

News of further cases then came to light.

CASE 6.—A young man, who stayed as a boarder on the farm from April 5 to April 10, went to bed with severe tonsillitis on April 9, and went home to Bristol next day. He had a rash which subsequently peeled, and his convalescence was complicated by rheumatic polyarthritis and acute nephritis. This case was not notified.

CASE 7.—A young man developed scarlet fever on April 13. He was on the same milk-round as the others.

The landlady of the house in the village where the two Croydon girls had stayed developed a sore throat, but her swabs were negative. There were also rumours of other sore throats and strange rashes in the village, but no further notifications were received. The carrier was committed to the care of his own doctor, and the control measures checked the outbreak with a dramatic suddenness which was surprising.

THE THIRD PHASE

CASE 8.—A notification was received on May 14 of scarlet fever in a little girl staying with her parents in the same furnished house next to the farm. Of the other members of the household a doctor, his wife, and the maid all had sore throats, but a baby was unaffected. These visitors, having only recently arrived, had not been warned to boil all milk, and the same farmer who supplied them did not tell them.

CASE 9.—On May 16 a man in the village developed scarlet fever. He had disregarded the warning to boil all milk, which he obtained from this same source.

CASES 10 and 11.—On May 18 a young girl, aged about 16, boarding on the farm, developed scarlet fever four days after her arrival. Her mother followed suit on May 26. Both these patients said that they had drunk unboiled milk in the farmhouse, but that their accommodation was separate from that of the farmer's family.

Repeated samples of milk were taken, but all cultures were heavily overgrown with contaminants. At this stage the other milker gave a positive swab result for group-25 hæmolytic streptococci, but subsequent tests were negative.

The inference was that the carrier, though taking no part in dairying, was intermittently infecting the other members of the farmer's family, and the milk was still being contaminated. Appeal was made to the moral sense of the farm household to ensure that unwitting holiday visitors should not be given unboiled milk, and that proposed boarders at the farm should be advised of the prevalence of scarlet fever. It is doubtful whether this appeal convinced the sceptical farm folk, but seven weeks' peace ensued. The carrier was still positive under his doctor's treatment, and the notice was kept in force.

THE FOURTH PHASE

CASES 12 and 13.—On July 22 it was reported that the carrier's sister and her little girl, who lived outside the area, had developed scarlet fever on July 15, four days after visiting the carrier. This infection was presumably by direct contact.

CASE 14.—A young man, who, with his wife, had been boarding on the farm since July 17, developed a sore throat on July 19 and a typical scarlet-fever rash on July 22. His wife had a mild sore throat. These visitors said that they had been given unboiled milk in the farmhouse, and that they had no direct contact with the carrier.

These were the last notified cases in the village, and the main holiday period of August passed off without any further troubles except a case of measles in the ill-fated furnished house next to the farm.

The carrier continued to undergo treatment, but he was intermittently positive and still worked at the farm. Dr. V. D. Allison, of the Central Public Health Laboratory, suggested a course of penicillin (100,000 units intramuscularly morning and evening for six days), but, before the patient's doctor had time to arrange this, the carrier decided to seek a job in another area. He was becoming very worried by all this attention and felt unfairly persecuted, so he went over the county border and resumed dairying once more.

The medical officer of health of that area was informed of the outstanding notice against the carrier, and he eventually persuaded him to seek another type of occupation until he is cured.

DISCUSSION

The clinical aspects of the cases were not unusual. In 5 of the cases of scarlet fever it was possible to ascertain clearly the time between exposure to infection and the appearance of the rash. This was four days.

The conception of scarlet fever as a clinical entity which is notifiable under the Public Health Act, 1936, bears little relation to its epidemiological significance.

Our carrier harboured in his throat, and transmitted to other persons, virulent hæmolytic streptococci. The entirely unsusceptible recipients experienced no ill effects. Those who were unsusceptible only to the erythrogenic factor developed a simple uncomplicated tonsillitis which was not notifiable. The susceptible recipients exhibited the classical syndrome and were notified.

This anomalous situation creates difficulties both in epidemiological control and in general practice, particularly in an area which receives a seasonal influx of susceptible youngsters, and in which hygienic standards are still primitive.

The laboratory isolation of hæmolytic streptococci from the milk was hampered by the overgrowth of contaminants. Poor shippons, improvised cooling, and the absence of a proper dairy and sterilising facilities rendered contamination almost inevitable; and, since the main outbreak was confined to the milk-round and was checked by control of the milk-supply, it is not unreasonable to accept the circumstantial evidence that hæmolytic streptococci were intermittently present in the milk.

The provisions of article 19 of the Milk and Dairies Order, 1926, included in the Milk and Dairies Regula-

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tions, 1926–43, are effective in securing the physical removal of the infected person from dairying operations, provided that the terms of the notice are conscientiously observed. The domestic difficulties of running a small family farm, and the impossibility of constant official supervision, somewhat detract from the force of the notice.

Moreover, even if the infected person does observe the spirit and letter of the notice, he still lives in the farm-house, and must from time to time infect the other members of the family, who in turn may pass infection into the milk.

Stoppage of the entire milk-supply under article 18 of the Milk and Dairies Order, 1926, requires such strong proof of contamination, and is beset by such time restrictions, that it is impracticable in a situation of this kind. Heat treatment of the milk in bulk is also impracticable in a remote rural area, and even advice to consumers to boil their milk has to be given with due regard to the avoidance of defamation, and in the face of rural prejudice against the heresy of questioning the sacrosanct qualities of milk.

The peculiar position of a non-notifiable carrier of a notifiable disease evades the removal powers of section 169 of the Public Health Act, 1936, whereby a justice may order the removal to hospital of a person suffering from a notifiable disease where the circumstances are such that proper precautions to prevent the spread of infection cannot be taken and that serious risk of infection is caused to other persons. Similarly there is no power to proceed under sections 148 and 149 of the Public Health Act, 1936, which penalises a person who, knowing that he has a notifiable disease, exposes other persons or articles to infection, or carries on an occupation to the danger of others.

The position of the boarding-house business of the farm also revealed anomalies in the law. Section 157 (2) and (3) of the Public Health Act prohibits the letting of lodgings, after a case of notifiable disease, until disinfection has been carried out. There was no contravention of these provisions at the farm.

Section 157 (1) of the Public Health Act, 1936, imposes a penalty upon a boarding-house keeper for making a false answer to a question of an intending lodger as to whether there has been any case of notifiable disease in the house during the preceding six weeks. The onus of raising this question rests upon the intending visitor, and it is not usual for holiday-makers to take such morbid precautions.

There is undoubtedly a moral obligation upon the landlord to disclose such known risks as the occurrence of recent cases of infectious disease or the presence of a known carrier in the house, and in default an action might possibly lie for civil damages. Hard cases may make bad law, but the medicolegal aspects of the case were cold comfort in the epidemiological control of the outbreak.

There remains now the problem of keeping track of this rather dangerous young man. He is a free subject to go at liberty where he pleases; and, as his new occupation is normally limited to the winter season, he may wish to revert to farming again next summer. Very understandably he feels persecuted by officialdom, and it will require a very high sense of moral duty to resist the temptation of escaping from the notice. In a smaller way his position is not unlike the case of "Typhoid Mary," except that his personal cure seems even more desirable to save him from possible cardiac complications. His return to the family circle in a dairy farm and boarding-house in a popular holiday district is too potentially dangerous to be viewed with an easy mind.

SUMMARY

An outbreak of 25 streptococcal illnesses, including 13 cases of scarlet fever, in a remote Lakeland village during 1948 is described.

The position of a milker who was a non-notifiable throat carrier of group-25 hæmolytic streptococci, living on a dairy farm which was also a boarding-house, is discussed in relation to epidemiological control and the medicolegal aspects.

I am indebted to the local general practitioners, the other medical officers of health, and the Public Health Laboratory Service for their assistance and coöperation.

Smallpox

Altogether 4 cases of smallpox have now been notified in Liskeard, Cornwall—the original case admitted on May 7 and the 3 close family contacts who had been isolated in hospital as a precautionary measure. On the sixteenth day of surveillance none of the other contacts showed any sign of the disease.

A case of suspected smallpox has been reported on board the liner *Mooltan*, now outward bound for Australia. The patient sickened on May 18, the liner having left this country on April 28.

Estimate of Births

The Registrar-General [1] estimates that births in England and Wales will number 190,000 in the quarter ending June 30 this year, and 178,000 in the quarter ending Sept. 30. In these estimates regard has been had to: (1) sample returns of the number of special ration-books issued to expectant mothers by the Ministry of Food, and (2) the recent trend of registered live births.

Boundary Commission's Annual Report

The report of the Local Government Boundary Commission for 1948 [2] reports a decision by the Government "that it will not be practicable to introduce comprehensive legislation on local government reconstruction in the near future."

Under the Local Government (Boundary Commission) Act, 1945, the commission have a continuing duty to keep under review the "circumstances of the areas into which England and Wales (exclusive of the administrative county of London) are divided for the purposes of local government," and to alter those areas "where it appears to the Commission expedient so to do"; and the commission intends to make formal statements of proposals for a number of areas, leading up to formal Orders. The major changes proposed in the commission's report for 1947 [3] would require fresh legislation.

Holiday Hazards

With unvanquished faith in the British summer, many will now be turning their thoughts to a camping holiday. Those unversed in this way of life would do well to arm themselves with an article written by Dr. C. G. Learoyd,[4] who discusses the medical risks with humour and insight. Dr. Learoyd views with unconcern the more common discomforts of a holiday in the open. "I do not believe" he says, "that damp blankets, occasional lack of groundsheets, and cold sleeping, although uncomfortable and undesirable, do any harm, but it is the instinct of mothers to attribute all subsequent disasters to them." Of water-supplies he takes a more serious view, for "it is a fallacy to suppose that because inhabitants have been drinking a water for years it is bacteriologically safe." As to bathing: "Man is essentially a terrestial animal; under water he is much inferior to the alligator who can close his nostrils by sphincteric action. It is not fussy to exclude children with running ears from swimming in pools, both from their own and their friends' points of view."

1. Registrar-General's Weekly Return of Births and Deaths for the Week ended May 7. H.M. Stationery Office. Pp. 20. 6*d*.
2. H.M. Stationery Office. Pp. 7. 2*d*.
3. See *Lancet*, 1948, 1, 610.
4. *Practitioner*, 1949, 162, 396. Also available as a pamphlet, price 1*s*., from the *Practitioner*, 5, Bentinck Street, London, W.1.

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In England Now

A Running Commentary by Peripatetic Correspondents

American English and English English seem to me to be drifting rather rapidly apart. I have yet to hear an American repudiate the suggestion that he spoke English, but most of them would now reply "American" to the question "What language do you speak?"—which they would have done some years ago. And they would be right. Five years' daily contact with American colleagues and American publications and documents makes me think that the divergences are developing most rapidly in two quite different fields. The colloquial speech and slang of the ordinary American has become incomparably more racy and vivid than that of the English: the greetings and wisecracks going round the elevator in a Washington office of a morning are like flames crackling in an old briar bush. On the other hand, let them put pen to paper—or fingers to typewriter—and the dreariest and most incomprehensible jargon emerges, worse than the worst efforts of a lower middle-class (educationally speaking) Scot.

Brooding recently on why, of the papers published after an international symposium on social medicine in New York, I had enjoyed the few non-American ones more than the others although their content was certainly not superior, I came to the conclusion that it was largely a result of the American passion for the long, ugly, and prefenably new word over the short common one. Listen to this, for example: "The significance of causation lies in the fact that effective treatment, whether preventative or curative, is predicated upon thorough elimination or control of causative influences." And yet the same writer goes on, in the very next sentence, to say: "We can hardly expect to obtain a lasting cure of a sore heel if we neglect the nail in the shoe." In the second sentence of 21 words there are 16 of one syllable and 5 of two, in contrast to 25 words in the first sentence of which 4 have three syllables, 4 four, and 1 five. No wonder Ryle, Sigerist, and Horder are more appealing! In the same paper we find: "It would be immensely beneficial to all our thinking if the singular of the word 'cause' were deleted from our vocabularies, and the more flexible term 'causative factors' used in its place." A few pages later the writer himself disregards so unattractive a proposal.

What are the respective remedies? American films, but for the dollar shortage, might go far to improve our daily speech—or lack of it—but to make American technical articles readable there is nothing for it but a reprinting and widespread transatlantic distribution of the pamphlet, "On writing for *The Lancet*," of which I believe the few remaining copies would now be described in booksellers' catalogues as "v. scarce, much foxed."

* * *

In its exhibition now on view at Walker's Galleries in New Bond Street, the Medical Art Society achieves a professional level; and there are some pictures of high quality. The palm goes to the water-colours, because Dr. Henry Wilson is possibly as successful in this medium as any artist now living: he convinces one that he did exactly what he wanted to do, and that it was well worth doing. Mr. F. N. H. Maidment and Dr. Reginald Morshead (especially in his "Smith Square," 113, a fine strong composition) are runners-up; Dr. C. H. Whittle (especially in "Willows," 89) produces charming light and movement, and Dr. A. M. Rakow ("A Corner of a Field," 120) colour, solidity, and balance. Mr. Holmes Sellors ("Winter 1949," 75) is good, and so is Dr. Eric Topham: the wistaria blossoms in his "Denham," 97, look amateurish until one suspects, after seeing the competence of "The London Apprentice," 111, that they are, after all, quite deliberate. Sir Henry Bashford's three drawings are astonishingly original: it is not easy in these days to achieve an individual vision and technique.

Among the oils it is a little disturbing to find that Dr. A. B. Hewlett has sacrificed his originality to his admiration of a contemporary, skilful and massive though the result may be. Dr. R. A. Beaver's "Garlic and Onions," 69, in white, yellow, and beige, is an attractive piece of colour, and so is his "Porte des Halles," 50, in which hardly any colour is used. This achievement of effect with great economy is impressive: the same is true of Dr. Charles Branwell's "Harvesting in Cornwall," 32. Dr. W. J. Benzimra's "Still Nature," 53, has a pleasing colour scheme: his portrait (64) is charming at close view, but fails when seen from a distance because of the relation of the subject to the size of the frame.

There are four surrealist pictures, but the one which has the real nightmare quality is Dr. M. B. Ray's "Old College, Edinburgh," 46, a blank courtyard between receding buildings with a receding succession of staircases. That it may not have been intentional does not detract from this quality; presumably the more unconscious a surrealist picture is, the better. Dr. Leigh Silver's "Creator Crematorii," 60, which seems to represent Mr. Bernard Shaw with a cat-skin on his head, is a proper problem picture. Dr. A. C. Dalzell's "Friern Farm," 42, is a deceptively simple-looking composition. Dr. Lorna King ("Landscape," 9), Dr. Helena Wright ("Bohinska Jazzio," 10), and Dr. Frank Roles ("Thames at Twickenham," 36), have original things to say; but there are plenty of quite good pictures which are frankly derivative, from Van Gogh, Rousseau "Le Douanier," the Academics, the Post-impressionists, and the Moderns.

On the whole it is the technique and the personal vision that are conspicuous in this exhibition. Perhaps the professional painters are performing unrecorded miracles of medicine. If not, they had better come to see these pictures and ask themselves some pertinent questions.

* * *

A word of warning to fellow sufferers from post-Health-Service depression. While I was taking ten days off to recover from a rather severe attack a psychiatrist friend offered me a few shots of E.C.T. as a good pick-me-up with which to end the holiday. I accepted and they certainly helped to relieve the tension brought on by a surfeit of forms and faces; but the sequelæ were none too good. A minor inconvenience was amnesia for a few isolated events which had occurred just before or during the holiday. None were important, but it was a bit disconcerting to be accosted by a proud mother with child and not have the slightest recollection whether I had delivered her or not. It was also a trifle annoying to get lost in a village which I had visited three weeks earlier. But a much more unpleasant aftermath was an at times almost uncontrollable desire to escape from reality; and reality for me consisted of my daily quota of fifty or so N.H.S. patients. However, in a few weeks the acute phase passed and now a couple of months later I am prepared to think that E.C.T. plus a long holiday may work wonders for sufferers from our complaint. But E.C.T. followed two days later by general practice of 1949 vintage—well, I wouldn't wish it to Bevan himself.

* * *

"Please bring me back a coconut," said my secretary. I reminded her that the baggage-limit for air-passengers was only 66 lb. and suggested that a groundnut might do instead. She was adamant, however: nothing less than a coconut would satisfy her. Two weeks later I was looking at a surprisingly cheerful little colony of lepers in the Infectious Diseases Hospital at Dar-es-Salaam when an African shinned up a very tall coconut palm and started knocking down the coconuts with a jolly clatter. This finished, he climbed half-way down and sang a sort of song of triumph. It was a merry, rolling little ballad, and I was reminded of my secretary's request. I told the story to my host, and it was overheard by an Indian sub-assistant surgeon. Next day two tiny little coconuts (air-mail size) were delivered to me with his compliments. In due course my secretary was delighted. Was not this a charming little act of Indian courtesy?

* * *

Surely great possibilities are opened up in the N.H.S. by the surgeon at our hospital who wrote on a case-paper: "This patient requires a hernia for his truss."

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Letters to the Editor

ASSESSMENT OF "COLD CURES"

SIR,—Several recent reports have been enthusiastic in praise of anti-histamine drugs in the treatment of common colds. "The abortion of the common cold is so truly unique, it must be seen to be appreciated." [1] We feel it important that, to prevent repetition of the many disappointments of the past, potential "cold cures" should be subjected to most rigorous tests; these must include provision of approximately equal groups of patients receiving test drug and placebo, and exclusion of all possibility that either patient *or clinical observer* has any suspicion as to who belongs in which group.

We carried out a small trial on 'Neoantergan' ('Anthisan,' May & Baker), one of the anti-histamine drugs most highly acclaimed.

The trial took place between Dec. 11, 1947, and Jan. 12, 1948, on 22 volunteers. Two types of tablets, one containing 100 mg. neoantergan in each tablet, the other lactose, were used; they were of similar size, shape, and tint (green), so that they could not readily be distinguished. Each lot of tablets was placed by one person in a bottle and labelled A or B; and these two bottles, but no further information, were given to a second person, who distributed them in a randomised order to each volunteer as he presented himself. A third person examined the patients. Thus neither distributor nor examiner knew which patient received which substance; nor did the examiner have any indication which bottle had been used for any given patient.

The placebo was received by 10 volunteers, neoantergan by 12. Only those who had started a cold within the previous twenty-four hours were accepted as volunteers. At the first interview they were asked about the duration of the cold; whether there was blocking of the nose, fullness of the head, clear or yellow nasal discharge, sneezing, sore throat, hoarseness, cough, running at the eyes, headache, malaise, or rise of temperature; and finally, how many handkerchiefs they were using a day. They were instructed to take 3 tablets daily for two days (total dose of neoantergan in those who received it was therefore 0·6 mg.). Examination took place on the 1st, 2nd, 3rd, 4th, and 7th days after beginning the treatment, and each volunteer was asked first if he was cured, improved, unchanged or worse; then how many handkerchiefs he had used; and whether there was any change in his symptoms.

The results of the trial can be summarised as follows:

Patients' opinions.—Of the 10 who received the placebo, 4 benefited, 4 did not, 2 could not say. Of the 12 receiving neoantergan, 4 benefited, 7 did not, 1 could not say.

Average duration of the cold.—In those receiving the placebo, this was 6·2 days; in those receiving neoantergan, 6·5 days.

Examiner's estimate.—On the working assumption that the drug was beneficial, the examiner attempted, after weighing all the available facts, to place correctly each of 17 patients into either the "drug" or "placebo" group. Of the first 8 cases, his estimate was correct in 7; but, alas, in the succeeding 9, he was wrong 8 times.

The results of this small experiment thus fail to show any dramatic effect of neoantergan on the common cold. We do not bring them forward as evidence that there is no beneficial action, but only to draw attention to the necessity for rigorous control of any test of a remedy for colds; the need to depend on subjective judgments by patient and clinician alike make such tests particularly difficult.

W. D. M. PATON
F. FULTON
C. H. ANDREWES.

National Institute for Medical Research, London, N.W.3.

1. Brewster, J. M. *U.S. Naval med. Bull.* 1949, **49**, 1.

STREPTOMYCIN IN NON-TUBERCULOUS CONDITIONS

SIR,—Mr. D. F. Smith, in his letter of May 14, criticises our communication of April 30 on the grounds that the volume of streptomycin itself in the solution would appear to have been ignored.

We were fully aware of this point and of the fact that different salts of streptomycin occupy slightly different volumes in solution. In practice the difficulty was overcome by giving successive doses from the same ampoule to the same patient. Thus in urinary cases the 1 g. ampoule of streptomycin was diluted with 4 ml. pyrogen-free distilled water; from the ampoule 2 ml. was injected intramuscularly for the first dose and the remainder for the next dose.

P. H. BUXTON
Middlesex Hospital, London, W.1. Medical Registrar.

SPONTANEOUS HYPOGLYCÆMIA

SIR,—Since the introduction of insulin for the treatment of mental illness, many things have become clear which were imperfectly understood when hypoglycæmia was principally a diabetic mishap. Just as a heavy and symptomless hyperglycæmia may be produced by the injection of large quantities of glucose intravenously, so may a severe hypoglycæmia be produced by the intravenous injection of insulin in a dose varying from a few units to several hundreds. When this is done, the production of symptoms lags well behind the fall in blood-sugar. Uncommonly (but quite certainly) a hypoglycæmia of 20–30 mg. per 100 ml. may be maintained for over two hours without the slightest clinical sign or symptom. I have seen such a case, showing, as it were, normal reactivity to insulin but complete resistance to hypoglycæmia. This patient, who suffered from schizophrenia, received 300 units of insulin intravenously, together with a similar dose intramuscularly, without the slightest effect, and eventually attempts at treatment by this method were abandoned.

On the other hand, while a very low blood-sugar may be unaccompanied by symptoms, the case described by Hill and others [1] showed that symptoms may occur at a blood-sugar level which would be regarded as normal, but which is low for that particular patient. In that case, clouding of consciousness and violent behaviour developed when the blood-sugar fell to 100 mg. per 100 ml. Further, when hypoglycæmia is in fact accompanied by symptoms, these are not always of the kind described in the text-books. Tension may be replaced by pleasant relaxation, or by the querulousness to be observed in committees as tea-time approaches, or by murderous violence as in Hill's case.

Like many others, I have for years included dietetic advice in my treatment of patients with fluctuating states of tension where a hypoglycæmic factor appeared possible. In spite of rationing, some patients still find it possible to have bacon for breakfast and biscuits at eleven, but I have never found a case where this method alone relieved symptoms.

These anomalies can only be explained if spontaneous hypoglycæmia is regarded as but one "indicator" in a dynamic autonomic-endocrine system—a result and not a cause. It seems more probable that emotional disturbance produces "spontaneous" hypoglycæmia rather than the reverse, though such disturbance is by no means always appreciated by the patient himself. Donnelly and Palmer,[2] in a study paralleled by others, found most of their cases to be tense, emotionally unstable, and working under stress. It is well known that tense patients show autonomic-endocrine lability—their hearts beat quickly for little reason and just as quickly the rate subsides, their faces blush or go pale, and their bowels display either excessive activity or the most obstinate inertia. Neither sympathetic nor parasympathetic system predominates consistently, for excessive activity of one is readily compensated by the other, and the clinical picture is one of incessant fluctuation. Possibly it is this variability which is the most disturbing physiological

1. Hill, D., Sargant, W., Heppenstall, M. *Brit. med. J.* 1944, **i**, 162.
2. Donnelly, G. L., Palmer, Y. S. *Sth. Med. Surg.* 1944, **106**, 363.

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feature, and it may well be that rapid changes in blood-sugar level are far more important than either hypoglycæmia or its opposite. Conceivably this may explain the uneasiness and tension of which some patients complain immediately after a substantial meal when the blood-sugar is climbing fast and high.

This is not to deny that spontaneous hypoglycæmia as described by Dr. Hastings-James can exist. But there seems little reason to depart from criteria well established for the diagnosis—that the blood-sugar should be low for *that* patient and not as judged by ordinary standards, and that the symptoms can be reproduced by insulin and relieved by glucose. And it is worth recalling the emphasis laid by Harrison and Finks [3] on the uselessness of the glucose-tolerance test. With these criteria, I believe the condition is rare and that most apparent examples merely show in their blood-chemistry one facet of a general functional instability. This concept makes unnecessary Dr. Hastings-James's distinction between nervous and reactive hypoglycæmia—a distinction about which, in his very interesting paper, he himself seemed a little unhappy.

Westminster Hospital, London, S.W.1. GERALD GARMANY.

GYNÆCOMASTIA WITH AMPHETAMINE THERAPY

SIR,—The letter of May 14 from Dr. Mason and Miss Morris raises the interesting question of the power of amphetamine to cause impotence, which has been frequently reported.

It would, however, appear that there may be, in the male, another physical effect of taking this drug, for many patients have reported that micturition acquires a tiresome attribute commonly associated with an enlarged prostate—namely, the voidance of a certain quantity of dribbled urine, after the process had appeared to be complete. This seems to diminish with time, much in the same way as the power of the substance to lessen appetite is also invariably lost in a varying period.

London, W.1. CHRISTOPHER HOWARD.

THE MEDICAL ILLUSTRATOR

SIR,—I note with pleasure that THE LANCET is sufficiently interested in medical art to publish a special article on it (April 23). Miss Treadgold, however, deals chiefly with visual aids and posters for which the technique of commercial art is required, whereas most of our work consists in drawing and painting specimens and operations or patients; and for this type of work the long training and skill of an artist is necessary.

May I make a plea for the coöperation of the medical profession in helping us to raise the general standard of medical art? A glance at the illustrations in journals of the last fifteen years will show that, with obvious exceptions, this standard has fallen since pre-war days. Publishers are anxious for better drawings, and most artists wish to supply them.

At a recent meeting it was gratifying to note that a large majority of medical artists preferred the title of "medical artist" to that of "medical illustrator," and they hope to be worthy of their choice. To combine art and science is not an easy task, and the appreciation and constructive criticism of medical men who value both is most helpful and stimulating. The foundation of medical art is good drawing and painting; this sounds obvious, and yet it does not always receive the consideration it deserves. There is a tendency today to demand quantity rather than quality, with the result that some artists have little chance to do first-class work, while newcomers have not always the time or opportunity to study properly the details of operations, specimens, tissues, and bone formations. Once a student becomes really familiar with her material she can work rapidly as well as accurately.

An ideal department of medical art should have a first-class artist with wide medical experience in charge of all branches of the work. This principal would train students, draw for reproduction, and act in close coöperation with the department of medical photography. If poster work is called for, it would be well to employ a commercial artist whose work would be supervised by the principal. Such oversight would ensure sound figure-drawing, good colour, humour without crudity (the humour of *Punch* rather than of the comic strip), and a general effect that is both artistic and arresting. There is much excellent commercial art which might well set the standard for medical cartoons and posters.

Another point calling for attention is the deplorably poor reproduction of much of our work. Not uncommonly an artist fails to recognise her own published drawings at first sight. The difficulties and expense of good reproduction do not prevent some firms from achieving satisfactory results, so perhaps we may hope for a general improvement in the future.

D. DAVISON
Medical artist to Manchester University.

ANTI-HISTAMINE DRUGS IN THE TREATMENT OF BURNS

SIR,—On May 12, a woman, aged 40, showed me a two-day-old scald of her right forearm, due to boiling rhubarb. A blister, containing thick semi-gelatinous fluid, between the middle of her forearm and the wrist, was removed and the raw area dressed with penicillin ointment.

She was complaining a lot of pain, and since I had previously noted rapid skin healing in a 15-year-old ulcer of the leg where 'Anthisan' had been exhibited to stop the scratching of a concomitant rash, I decided to try the drug in this case, giving 500 mg. per day by mouth, for its sedative side-action and in order to observe its effect on the area of erythema.

By May 16, instead of a weeping ulcer I saw a translucent and just perceptible layer of epithelium covering the base of the blistered area. Three days later the blistered area was of substantial thickness but still semi-translucent. There was also dry desquamation of about half the erythematous area between the blister and the elbow. The patient expressed great delight, for, after seeing the amount of blistering, she had expected to have an ulcer for months.

Incidentally, while on anthisan she has been free of the pain of a postoperative "spastic colitis."

I wonder whether the anti-histamines may do for burns what the antibiotics have done for sepsis. Some of the side-actions of the anti-histamines may be depressive, and until the limits of safety are known they should no doubt be withheld in the presence of severe shock.

Manchester. S. SHUBSACHS.

DECAMETHONIUM IODIDE IN ANÆSTHESIA

SIR,—I note with some dismay the necessity for an interim report on such a drug as decamethonium iodide, arising from the premature marketing of the drug. Dr. Organe's report of May 7 is a lucid account of the findings with the drug in 150 cases, under ideal conditions with full facilities for dealing with any emergency. I feel, however, that Dr. Organe would be the first to admit that such a series is bare evidence upon which to release the drug.

Dr. Hewer and his colleagues (May 14) indicate that the recommended antidote is unsuitable for use, though they appear satisfied with the drug itself, again from a short series of cases.

The production of the drug now enables it to be used under conditions which may sometimes lead to difficulty, particularly because the drug is miscible with thiopentone. To my mind, one of the factors contributing to the relative safety of *d*-tubocurarine chloride is that it is immiscible with thiopentone. Thus it is impossible to give full doses of the two drugs from the same syringe—a temptation which must be considerably lessened, even among the more adventurous, when the two solutions are in separate syringes.

No-one would decry any new technique before making personal trial, but let us not be too adventurous in administering these potent anæsthetic adjuvants; let us yet remember that the safety of the patient has our first claim to attention. *In somno securitas.*

Royal Berkshire Hospital, Reading. K. BRYN THOMAS.

3. Harrison, T. R., Finks, R. M. *Amer. Heart J.* 1943, 26, 147.

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WERTHEIM'S OPERATION

SIR,—There must be many gynæcologists in Great Britain, in addition to Mr. Stallworthy (April 23) and Mr. Goodwin (May 14), who have been treating cases of carcinoma of the cervix by the combination of irradiation and extirpation if the case is operable. The advantage of preliminary irradiation before undertaking surgery is very apparent, and so is the surgical removal of the parametrium. Whether to be content with this, as in the Wertheim operation, or to perform also an incomplete removal of the lymph-glands, as in the Bonney operation, is a highly debatable point which is not well argued in a letter.

If the carcinoma is developing in the anterior part of the cervix, so that the bladder is early involved and the natural barrier between the cervix and bladder is broken down, the case is inoperable by ordinary standards; and for this type of case I performed, in 1943, hysterocystectomy in continuity after preliminary ureteric transplantation. The case and the argument for the operation (which unfortunately was unsuccessful) were presented to the Medical Society of London in 1943; and the specimen is in the museum of the Royal College of Obstetricians and Gynæcologists.

I note with great interest that Mr. O'Sullivan (May 14) has performed the operation twice. It is not the formidable undertaking that might be thought, and it can be done more quickly and much more simply than a classical Wertheim. In point of fact, it is an easy operation, and surgically, I submit, it has much in its favour.

London, W.1. EVERARD WILLIAMS.

PARA-AMINOSALICYLIC ACID IN LUPUS VULGARIS

SIR,—Since 1946, in the lupus clinic at Belmont Road, Liverpool, I have used massive doses of vitamin D_2, in tablet form, by injection, and as a prophylene-glycol solution (Glaxo Laboratories) and the alcoholic solution of 'Sterogyl 15' (Roussel) by mouth, and I find that all except the injections tend to raise the serum calcium, and all, including the injections, are liable to lessen renal efficiency and raise the blood-urea. Messrs. Glaxo Laboratories found by animal experiments that non-irradiated ergosterol stimulated the reticulo-endothelial system more than calciferol did and had not the disadvantage of causing renal damage. From February, 1948, to April, 1949, I therefore treated 15 lupus patients continuously with non-irradiated ergosterol, starting with 30 mg. daily and gradually increasing to as much as 600 mg. daily. The serum calcium, estimated fortnightly, was never raised, and urea-clearance tests, repeated three-monthly, remained normal throughout for all. The patients showed definite improvement, put on weight, and felt better than usual; but as none were cured I abandoned this treatment. Non-irradiated ergosterol also proved useless in 3 cases of psoriasis previously helped by calciferol.

One of my patients on high-potency calciferol tablets, who had at first responded well but was not cured after three years' treatment, not only ceased to respond but showed a sudden enlargement of his area of lupus. Radiography of the chest and sputum tests were all negative. In an endeavour to prevent further spread, at the suggestion of the tuberculosis specialist at Belmont Road, I gave the patient 20 g. of *p*-aminosalicylic acid ('Paramisal') by mouth daily. I also had a cream made of 15% paramisal powder in a special high emulsifying base, and the lesion was dressed twice daily with this, the cream being kept in close contact with it. The result was surprisingly successful. The crusted outer margin became nearly level in a few days; by the end of the second week two areas in the centre of the lesion began to clear; during the third week the clear areas became much larger. This improvement was far greater, considering the duration of treatment, than I have ever seen with vitamin D_2 in any form.

I was so impressed by this case that I have started 7 patients on paramisal and will add to the number week by week. The number is limited by the shortage of paramisal. To ascertain whether the result is due to the general or the local treatment or to a combination of both, some patients are being given the drug by mouth, some local treatment, and others general treatment with local in some areas only. If the treatment proves successful, we shall have a safe method of treating lupus in patients with pulmonary phthisis, and one which, if reports are correct, does not cause kidney damage. To confirm the latter point, all patients have had a urea-clearance test before starting treatment and will have it repeated at the end of their three months' course.

When I embarked on this series I was unaware that *p*-aminosalicylic acid had previously been used for skin tuberculosis, but I find that Lemming[1] reported rapid healing in a tuberculous ulcer of fifteen years' standing after the application of gauze wetted with a neutral 10% solution of *p*-aminosalicylic acid.

Rodney Street, Liverpool. TERESA LIGHTBOUND.

DISABILITY THROUGH NEGLECT

SIR,—Your leading article last week comments on the recent Ministry of Health circular concerning reablement and resettlement addressed to hospital authorities, and in doing so perpetuates an obvious error in it. Medical interviewing committees, it says, will include "a *general* practitioner who knows the local industries." Should this not read (and should the circular not read also) "a *medical* practitioner who knows the local industries?"

Birmingham. DONALD STEWART.

CHLOROMYCETIN IN TYPHOID FEVER

SIR,—I would like to thank Dr. Bradley for his interesting preliminary communication last week, but feel that in the interest of clear thinking I must join issue with him on his last paragraph.

He regrets that he did not get his cases early enough to start 'Chloromycetin' in the first week. He allows the general practitioner four days' unexplained fever. For each case he has the date of the ingestion of the bacillus, the date of onset of the illness, the date of first consultation with the doctor, the date of first suspicion of the diagnosis, the date of confirmation of the diagnosis, and the date of reception in hospital; and I think he will find that his permitted delay was little if at all exceeded in the 24 or so "first" cases, while the others were reported with less delay.

No, his very proper disappointment—from the standpoint of investigating chloromycetin—is that the outbreak failed to become an epidemic, and he had no subsequent cases. I can assure him that if the infection had been water-borne or milk-borne he would have had his subsequent cases early enough, but I am afraid it would have upset his plan to combine the earliest possible treatment with the selection of alternate cases; the series would have been complicated by various other infections. As it is, one of the first suspects, indistinguishable from the others for the first four days, turned out not to have typhoid, but to be the only one who conformed to the original diagnosis; and so this case has not appeared among the statistics.

This outbreak was compact, and if recorded with meticulous accuracy, as I think it will be, should form a solid brick in the building of the collected statistics of chloromycetin.

I would like to add a sincere appreciation of the promptness, efficiency, and kindness of all the services coördinated by the M.O.H., and state my opinion that, though mostly unseen, they nevertheless had a profound steadying influence on the local population.

Crowthorne, Berks. H. D. FORBES FRASER.

SIR,—Dr. Bradley's preliminary report last week is obviously of the greatest interest and importance. May I however be permitted to make one observation bearing on the whole question of the technique of clinical research? His discussion of results illustrates the fallacy of the "alternate case" method of selection when applied to the infinite variability of clinical material; and it is clear that Dr. Bradley in coming to his preliminary conclusions has made much more use of the alternative and much superior technique of clinical research of the "detailed analysis of the test case."

May I, in all deference, make the plea, chiefly on scientific but also on humanitarian grounds, that the

1. Lemming, R. *Lancet*, Jan. 29, p. 200.

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fallacious "alternate case" method of selection be at once abandoned, and that all cases of at any rate severe typhoid, that can be and are willing to be, shall be treated with chloromycetin?

London, W.1. DAVID H. PATEY.

Parliament

Nurses Bill

IN the House of Lords on May 17 the Nurses Bill was considered in committee. On clause 2 Lord LLEWELLIN moved an amendment providing that a standing nurse-training committee for a hospital area should advise and assist boards of governors of teaching hospitals only when requested to do so. If it was thought that these committees, because they held the purse-strings, were going to dictate to the great hospitals, he did not believe the Bill would succeed; if they were not going to dictate, there was no possible reason why the amendment should not be inserted.

Lord SHEPHERD pointed out that the teaching hospitals would be represented on these committees. The Government desired that the relations of the teaching hospitals to these committees should be exactly the same as that of the hospital boards. The teaching hospitals were not being invited to come into this scheme merely for the benefits they would receive, but because the Government were anxious to receive their experience, knowledge, influence, and leadership. Lord WEBB-JOHNSON thought that Lord Shepherd had avoided a fundamental point in not indicating more precisely the composition of a standing nurse-training committee. He had given no numbers, whereas rumour had it that the representation of the teaching hospitals was to be meagre. That might be quite satisfactory if it was only a matter of using influence, but if the committee was concerned with the affairs of the teaching hospital itself the situation was changed. He believed that considerable representation of the regional board was contemplated; and the board was to be responsible for providing offices and servants of the committee. Lord Webb-Johnson thought that this immediately made the committee practically a committee of the regional board.

The amendment was withdrawn.

Lord LUKE moved the deletion of clause 4 and the insertion of a new clause setting up a Hospital Grants Committee to administer the funds required by every institution in the training of nurses. Lord SHEPHERD, however, suggested that something more was required. A Grants Committee would duplicate the work of the General Nursing Council, and it might also have to duplicate the work of the standing nurse-training committees. It would be wrong to suggest that in the methods proposed teaching hospitals would have to go cap in hand for their money to these committees. The representatives of the teaching hospitals, with the representatives of the regional hospital board and other institutions, as members of the training committee would come together to argue their respective cases and reach common decisions.

Lord WEBB-JOHNSON said that the University Grants Committee had been a conspicuous success because it had adopted a judicial attitude in making educational grants. He thought the medical profession would have been very sorry if the distribution of funds for medical education had been placed in the hands of the General Medical Council. They would have regarded that council as an unsuitable body, because it was concerned with discipline and regulations. He would have no anxiety about the teaching hospitals being treated in exactly the same way as any other hospital provided they came under a judicial committee and not a regional committee.

Lord MORAN said the original decision to keep the teaching hospitals outside the region was a decision made deliberately so that they might continue their work in giving a lead in medical education. Every argument used in favour of this course at that time by Government spokesmen was applicable to the present issue. That course had one disadvantage. Admittedly it might lead to a certain amount of ill-feeling between the teaching and the non-teaching hospitals. But this amendment got over that difficulty because the Hospital Grants Committee would give grants alike to the teaching hospitals and to the non-teaching hospitals.

Viscount ADDISON, Lord Privy Seal, said that today the same kind of apprehensions existed as had shown themselves when it was first proposed to set up the University Grants Committee. Yet Lord Webb-Johnson and Lord Moran, speaking with immense authority, now testified to the immense benefit of that committee to the teaching hospitals, and to the fact that their independence had not been undermined. This amendment, in Lord Addison's opinion, was carrying isolationism too far. There were about 36 hospitals with medical schools; there were 600 institutions which taught nursing. In a great national scheme like this why should these institutions not get the benefit of the experience and direction of the people who had been pioneers for so long? Why should the teaching hospitals want to be isolated from the rest? That was the only object of the amendment. It was not statesmanship, it was folly. He later added that the Government were willing to consider the matter further, but he must not be taken as giving an undertaking of any sort. They were satisfied that the machinery of the Bill was the right machinery.

The amendment was carried by 48 votes to 19.

Lord WEBB-JOHNSON moved a new clause providing that the General Nursing Council might prescribe or approve training of registered nurses in specialised branches of training. He said there was anxiety that the closing of the supplementary parts of the Register might lead to discouragement in the specialised branches, and to fear lest nurses sent to special hospitals for short periods during their training should be regarded as being expert in those particular branches. Viscount ADDISON hoped the clause would not be pressed at present. There should be a sound training with a proper certificate, and not a lot of odds and ends of so-called qualifications which were not altogether convincing to those who knew, but might be to those who did not know. It was much better to let the scheme get started and feel its way. In time additions could be considered. Lord AMULREE said that at present, in most of the big training centres for children's nurses, the training was practically complete. These hospitals were recognised as full training schools for children's nurses. He thought it would go a long way to meet apprehensions about this Bill if some assurance was given that it was not proposed to change the status of these children's hospitals as full training centres for children's nurses. After further discussion, Lord ADDISON said that, while he had the greatest possible misgivings about any scheme which would dispense with a sound general comprehensive training, he would gladly discuss the point further with Lord Webb-Johnson. In regard to the point raised by Lord Amulree, he could, of course, give the assurance asked.

The amendment was withdrawn.

QUESTION TIME

Hospital Administration in Scotland

In answer to a question Mr. ARTHUR WOODBURN stated that in Scotland the present number of officers engaged in hospital administration (including clerical and typing staff) was about 2200, which comprised the staffs of the five regional boards, the 84 boards of management, and the 425 hospitals in the service. He added that the figure for administration was about $3\frac{1}{2}\%$ of the total expenditure, which he thought was "a very good percentage for effective and efficient management."

Remuneration of General Practitioners

Major TUFTON BEAMISH asked the Minister of Health if he would publish in the official report the resolutions of the General Medical Services Committee following their meeting with him to discuss the case for increased remuneration of general practitioners, what action he now proposed to resolve the deadlock that had arisen, and if he would state his policy with regard to these resolutions.—Mr. A. BEVAN replied: There is no question of deadlock. I am in the midst of negotiations with the General Medical Services Committee on the remuneration of general practitioners, and I would prefer to make a statement on their conclusion.

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Borderline Cases of Mental Illness

Mr. HEATHCOAT AMORY asked the Minister what authorities were responsible for the care and training for employment of borderline cases of mental illness, not requiring treatment in mental institutions, mental hospitals, or at outpatient clinics.—Mr. BEVAN replied: If the persons in question are not in need of care and treatment either as inpatients or outpatients, it would not appear that either the regional hospital board or the local health authority have responsibility. The question of training for those who need it to enable them to take employment falls within the purview of the Minister of Labour and National Service. I think that a great deal of training is already done.

Accommodation for Mental Illness

Replying to a question Mr. BEVAN stated that 641 additional beds for mental defectives had been provided in the year 1948: of this number 72 were for children.

Mr. R. W. SORENSEN asked the Minister to what extent mental hospitals in London and the Home Counties were overcrowded; approximately what proportion of beds and wards was not being used through lack of staff; and whether recruitment for the mental hospital service was progressing or retrogressing.—Mr. BEVAN replied: The accommodation in use is overcrowded by 4048 beds (approximately 11% of the total). The proportion of bed space available but not being used through lack of staff is 4·1%. Separate figures for wards not in use for this reason are not available. The recruitment of nurses is progressing; in 1948 there were 15% more nurses employed in these hospitals than in 1945.

Supply of Spectacles

Mr. SOMERVILLE HASTINGS asked the Minister whether his attention had been called to the fact that, under the National Health Service Act, two identical pairs of spectacles might now be secured without payment, one through a hospital and one through an ophthalmic optician; and what action he was taking to prevent such abuse.—Mr. BEVAN replied: I am considering whether any steps ought to be taken to prevent the possibility of abuse.

Venereal Disease in the B.A.O.R.

Replying to a question Mr. EMANUEL SHINWELL stated that the incidence of venereal disease among National Service men (i.e., those called up on or after Jan. 1, 1947) in B.A.O.R. during 1948 and the first quarter of 1949 was as follows:—

Quarterly rates per 100 strength

	1948	1949
1st quarter	0·9	0·7
2nd quarter	1·2	..
3rd quarter	1·0	..
4th quarter	0·9	..

These figures were derived from a special return and were subject to a small margin of error. Comparable figures for National Service men in Home Commands are not available.

Appointments

BARNARD, H. F., M.B. Lond.: senior pathologist, Hull Royal Infirmary.

PARKER, THOMAS, L.R.C.P.E., D.P.H.: administrative medical superintendent, Board of Management for Paisley and District Hospitals.

Hospital for Sick Children, Great Ormond Street, London:

CAMPBELL, JANE, M.B. Aberd.: house-surgeon.

KINMONTH, M. H., M.B. Lond., F.R.C.S.: registrar, department of plastic surgery.

TROUNCE, D. Q., M.B. Lond., D.C.H.: house-physician.

Colonial Service:

BEAUBRUN, K. P., M.B. Brist., D.P.H., D.T.M. & H.: M.O., grade A, Trinidad.

CLARKE, G. H. V., M.A. Camb., M.B. Lond.: M.O. (dermatologist), Nigeria.

COLE, J. T. N., L.R.C.P.E.: M.O., Nigeria.

COURTENAY, RACHEL, M.B. Punjab: school M.O., Grenada, Windward Islands.

GORDON, S. G., M.B. Lond.: M.O., Nigeria.

HENSHAW, L. M. E. R., O.B.E., M.B. Edin., D.T.M.: senior M.O., Nigeria.

HORN, D. W., M.B. Edin., D.T.M. & H.: M.O., Nigeria.

LOWRY, JOSEPH, M.B. Belf.: M.O. (pathologist), Kenya.

MCDOWALL, M. F., M.D., B.SC.: M.O., grade C, health department, Trinidad.

MOWSCHENSON, HENRY, M.D. Prague: M.O., Nyasaland.

TWOHIG, M. J., M.B. N.U.I.: M.O., Uganda.

WATTLEY, G. H., M.D. Brist., M.R.C.P., D.T.M. & H.: M.O., grade B, Trinidad.

Obituary

HENRY ANSTEY COOKSON

C.B.E., M.B. EDIN., F.R.C.P.E., F.R.C.S.E., D.P.H.

Dr. H. A. Cookson, formerly director of the pathological laboratories at the Royal Infirmary and at the Children's Hospital, Sunderland, died in Toronto on May 15. Since his retirement last year he had been on a visit to his two sons who have settled in Canada.

Dr. Cookson was born at Eastbourne in 1886, the son of Surgeon Major Henry Cookson, I.M.S. He was educated at Clifton College and the universities of Edinburgh, Cambridge, and London. As a student he was an all-round athlete; he played hockey for Scotland, he was awarded his blue for cricket, and he took part in international long-jump contests. In 1910 he graduated M.B. Edin. and three years later he took the F.R.C.S.E. Meanwhile he had held house-appointments at the Edinburgh Royal Infirmary, the Gloucester Royal Infirmary, and the Bristol General Hospital. He also for a time acted as senior demonstrator in anatomy at Edinburgh University. In 1915 he obtained the Cambridge D.P.H. with distinction in bacteriology, and later, while serving in the R.A.M.C., he was in charge of bacteriological laboratories at Rouen and Boulogne, with the rank of major.

After the 1914–18 war Cookson settled in Sunderland, where his colleagues were quick to appreciate the value of his work. Besides his appointment at the Sunderland Royal Infirmary he was also pathologist to the Darlington Memorial Hospital and the Sunderland Municipal Hospital, and he served as consulting pathologist to the Durham County Hospital. In 1922 he was appointed bacteriologist to Sunderland county borough, and he lectured in bacteriology at Sunderland Technical College. He conducted many inquiries in the North for the Director of Public Prosecutions, and he was a well-known figure at the assizes and coroner's courts of the county.

Dr. Cookson was elected F.R.C.P.E. in 1938, and in 1947 he was appointed C.B.E. He married Miss Elizabeth Chedworth, who survives him with two sons.

Births, Marriages, and Deaths

BIRTHS

BARLOW.—On May 19, at Harpenden, Herts, the wife of Mr. Donald Barlow, F.R.C.S.—a daughter.

DUTTON.—On May 16, the wife of Dr. John Dutton—a daughter.

GRAHAM BROWN.—On May 9, at Colac, Victoria, Australia, the wife of Dr. A. Graham Brown—a son.

GRATTAN.—On May 13, at Mombasa, Kenya, the wife of Mr. Edmund Grattan, F.R.C.S.—a son.

HOUSTON.—On May 14, at the British Military Mission, Ethiopia, the wife of Major Ronald Houston, R.A.M.C.—a son.

JÉQUIER.—On May 14, the wife of Dr. Michel Jéquier—a daughter.

KING.—On May 16, at Moreton-in-Marsh, the wife of Dr. Michael King—a daughter.

LEWIS.—On May 18, at Tonbridge, the wife of Surgeon Commander B. S. Lewis, R.N.—a son.

LONG.—On May 15, at Banbury, the wife of Dr. M. J. Long—a son.

MACKENZIE-WINTLE.—On May 13, at Sidmouth, the wife of Dr. Hector Mackenzie-Wintle—a son.

THORNTON.—On May 12, in London, the wife of Dr. Kenneth Thornton—a son.

UPTON.—On April 24, at Lautoka, Fiji, the wife of Dr. B. H. B. Upton—a daughter.

MARRIAGES

COVELL—STAMP.—On May 21, in London, Kenneth John Covell, M.R.C.S., to Elizabeth Ann Stamp.

TURNER—GRIFFITHS.—On May 21, in London, Arthur John Turner, to Margaret Anita Griffiths, M.B.

DEATHS

BABONAU.—On May 9, at Songhor, Kenya, Alexander Frederick Babonau, C.I.E., O.B.E., M.B. Edin., colonel, I.M.S. retd.

COOKSON.—On May 15, in Toronto, Canada, Henry Anstey Cookson, C.B.E., M.B. Edin., F.R.C.S.E., F.R.C.P.E., F.R.S.E., D.P.H.

DALZELL.—On May 18, Philip Dalzell, M.B. Lond., aged 43.

HOFFMAN.—On May 17, Harry Drummond Hoffman, M.A., M.B. Camb.

JONES.—On May 15, at Amersham, Henry Macnaughton Jones, M.B.R.U.I., aged 80.

LEICESTER.—On May 19, at Cold Ash, Newbury, John Cyril Holdich Leicester, C.I.E., M.D., B.SC. Lond., F.R.C.S., F.R.C.P., lieut.-colonel, I.M.S. retd., aged 77.

MARTIN.—On May 22, in London, Ernest William Martin, M.B. Edin., aged 72.

ROGERS.—On May 14, at Bournemouth, Kenneth Rogers, O.B.E., M.D. Lond.

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Notes and News

RATIO OF DOCTORS TO POPULATION

A DRAFT report on the medical professions in 23 countries, published last year in New York by the World Medical Association, records the ratio of doctors to population in various parts of the world. These figures were printed in the *Journal of the American Medical Association* of Jan. 1 (p. 38) and include the following:

Country	Population	Doctors	Doctors per 100,000 population	Population per doctor
U.S.A.	141,228,673	197,605	140	710
Great Britain	48,788,000	55,771	114	870
Denmark	4,044,725	4250	105	950
Canada	11,489,713	11,901	104	970
New Zealand	1,750,000	1800	103	970
Australia	7,500,000	7137	95	1100
Switzerland	4,000,000	3806	95	1100
Sweden	6,700,000	6360	95	1100
Spain	27,000,000	25,142	93	1100
Norway	3,126,000	2900	93	1100
Netherlands	9,000,000	8000	89	1100
Czechoslovakia	12,000,000	9300	78	1300
France	40,000,000	30,000	75	1300
Eire	3,000,000	2000	67	1500
South Africa	11,391,949	4800	42	2400
China	450,000,000	20,000	4	25,000

HOMES FOR UNMARRIED MOTHERS

A DIRECTORY[1] of homes and hostels for the care of unmarried mothers and illegitimate children has been published by the National Council for the Unmarried Mother and Her Child. It contains the names of all such homes which the council have been able to trace, whether they are affiliated or not; but this first issue is almost certainly incomplete, and the council will be pleased to hear of any institutions they have omitted. The directory begins with a list of homes and hostels, arranged under counties, followed by a classified list showing which are maternity homes, which give before and after care, and which are aftercare homes. It ends with a general index for rapid reference. The religious denominations of the homes are given, but nearly all of them will accept mothers of denominations other than their own. Doctors and social workers will find this little booklet very useful.

FOR PARENTS OF CEREBRAL PARETICS

EVIDENCE is growing that the earlier a child with cerebral palsy can be treated and trained the greater is his chance of avoiding severe deformities later. Parents, therefore, have a special responsibility to these patients, for they can do much, during the early years, to prevent the formation of bad habits and to encourage good ones. The British Council for the Welfare of Spastics have published some "Notes for Parents on the Home Care of Children Handicapped by Cerebral Palsy," in the form of a booklet[2] accompanied by a supplement, "Illustrations of Special Equipment." A clear, though necessarily simple, account of the nature of the handicap is followed by some sensible general considerations on treatment. The spastic type of the disease is distinguished from the athetoid, and the care appropriate for each is outlined. In paragraphs on teaching the athetoid child to relax Dr. J. H. Crosland and Mr. Henry P. Weston, who compiled the notes, remark that relaxation can be induced at a very early age, "say from twelve months onwards." Unfortunately athetosis is still rarely diagnosed before the second year; but an attempt at teaching relaxation can be made as soon as the disease is recognised or even suspected. "It is quite obvious," the notes go on, "that the expert will be able to achieve this more quickly and probably better than the amateur, but this is no reason why parents should not try and, indeed, many have been very successful." Few parents would feel heartened to make the attempt after reading this; and since experts are scarce, some children may thus lose the chance of learning relaxation early, when it can do most good.

Good exercises are advised for strengthening the abdominal and back muscles of the spastic child, for speech training, relaxation and exercise of the lips and tongue. Breath direction is learned by blowing feathers across a table, blowing bubbles, blowing out candles, sucking liquids through a straw, and blowing a whistle or mouth-organ. The illustrations of equipment show adjustable chairs, those for spastics being fitted with a stub on the front seat to keep the knees apart and thus overcome adductor spasm. Spoons and forks fitted with thick wooden handles suit these children, for their grasp is weak, and they need something substantial to hold. Spoon-handles can be bent in a curve, so that the bowl of the spoon when it is lifted turns naturally towards the mouth. Some educational toys include graded blocks to thread on posts, a sand-tray and pusher, and strips of material fitted with buttons and button-holes, laces to tie, and 'Zipp' fasteners, on which the child can practise the movements he needs to make in dressing himself.

1. Obtainable from the secretary of the council, 21, Coram Street, London, W.C.1. Pp. 40. 2*s*. 6*d*.
2. Obtainable from the Secretary of the Council, 107, Norfolk Avenue, Sanderstead, Surrey. Pp. 23. 1*s*. 3*d*.

JOURNAL OF DUTCH AND INDONESIAN TROPICAL MEDICINE

RECOGNISING that medical articles published in Dutch are intelligible to a comparatively small number of readers, and that the mother tongue of Indonesia—the Bahasa Indonesia—is still more restricted, a foundation with headquarters in Amsterdam has launched a new quarterly journal of tropical medicine in English—*Documenta Neerlandica et Indonesica de Morbis Tropicis*. The editors hope that much of the work done in Surinam and the Netherlands Antilles, as well as in Indonesia, will eventually be recorded in the *Documenta*. The annual subscription is £1 2*s*. 6*d*., payable to F. K. A. A. Lambrecht, 268, Rivierenlaan, Amsterdam Z, Netherlands.

University of Sheffield

Dr. James Sharpe has been appointed part-time lecturer in social and industrial medicine; Mr. David Lees, part-time clinical teacher in obstetrics and gynæcology; and Mr. R. B. Zachary, part-time clinical teacher in surgery.

Royal College of Surgeons of England

On Thursday, June 9, at 5 P.M., at the college, Lincoln's Inn Fields, London, W.C.2, Prof. Geoffrey Jefferson, F.R.S., will deliver the Lister Oration. His subject will be the Mind of Mechanical Man.

British Congress of Obstetrics and Gynæcology

This congress will be held at Friends House, Euston Road, London, N.W.1, from July 6 to 8 under the presidency of Sir Eardley Holland. The subjects for discussion include cæsarean section; the assay and clinical significance of pregnanediol in the urine; essential hypertension in pregnancy; the management of pregnancy in diabetics; the diagnosis, prognosis, and treatment of carcinoma of the uterus; and maternal mortality. Dr. Joe V. Meigs of Boston will give a guest paper on endometriosis. Further particulars may be had from the hon. secretaries of the congress, 58, Queen Anne Street, W.1.

Faculty of Radiologists

The annual meeting of the faculty will be held at the University of Sheffield on June 17 and 18. At the diagnosis section, Dr. Margaret Macpherson, Dr. J. L. Emery, and Dr. Thomas Lodge will open a discussion on Pulmonary Manifestations of Tuberculosis in Children, and at the therapy section there will be a discussion on Problems of Organisation in the use of Therapeutic Quantities of Artificial Radioactive Isotopes (speakers, Dr. A. S. McFarlane, Mr. W. Arrol, Mr. K. Fearnside, Dr. W. K. Sinclair, and Dr. J. J. Nickson). Both sections will join to discuss Metastatic Tumours of Bone, when the opening speakers will be Prof. S. L. Baker, Dr. F. Campbell Golding, Dr. A. C. Crooke, and Mr. G. W. Bloomfield.

Analgesia in Childbirth

Speaking at a meeting of the Royal College of Midwives on May 13 Mr. Aneurin Bevan, Minister of Health, quoted figures to show that midwives remained the mainstay of our arrangements for the care of women in childbirth. Of the 370,000 births which took place during the first six months of the National Health Service midwives attended 339,000. The increase in the use of analgesia was, he continued, striking. Domiciliary midwives had given analgesics in the last half of 1948 to 35% of the 116,000 cases they had attended. Among the hospital confinements the proportion of women who received analgesia was still higher. In the week ended April 23, for instance, in England and Wales of the 7018 women who were confined, 6349 received analgesia or anæsthesia.

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National Heart Hospital

On Wednesday, June 15, at 5 P.M., at 1, Wimpole Street, London, W.1, Prof. K. D. Wilkinson will deliver the St. Cyres lecture. He is to speak on Withering.

Indian Medical Service Dinner Club

The annual dinner of this club will be held on June 15 in London. Further particulars will be found in our advertisement columns.

Research Defence Society

Prof. C. Lovatt Evans, F.R.S., will deliver the Stephen Paget lecture on Thursday, June 9, at 3.15 P.M., at 26, Portland Place, London, W.1. He is to speak on Physiological Research and the Vivisection Act.

British Association of Physical Medicine

A course of lectures suitable for candidates preparing for part II of the diploma in physical medicine has been arranged on Tuesdays and Thursdays from June 9 to July 19 inclusive, at 5 P.M. Further details can be had from the hon. secretary, of the association, 45, Lincoln's Inn Fields, London, W.C.2.

Royal Society

On Thursday, July 7, at 2.15 P.M., at Burlington House, Piccadilly, London, W.1, Prof. A. V. Hill, F.R.S., will open a discussion on Muscular Contraction and Relaxation, their Physical and Chemical Basis. Contributions are expected to be made by Prof. H. H. Weber (Tübingen), Prof. W. T. Astbury, F.R.S., Prof. M. Dubuisson (Liége), Mrs. Dorothy Needham, F.R.S., and Prof. E. J. Conway, F.R.S. Prof. J. T. Edsall (Harvard) will give a general summary at the end of the meeting. Before the discussion, demonstrations will be given at 10.15 A.M. in the biophysics research unit, University College, London, of some of the experiments on muscular contraction to be referred to in the introduction.

International Conference on Audiology

The second of these conferences will be held in London immediately before the fourth International Congress of Otolaryngology. Meetings will be held on Friday and Saturday, July 15 and 16, at 1, Wimpole Street, London, W.1, under the presidency of Prof. Gunnar Holmgren, of Stockholm. Prof. H. C. Huizinga, of Gröningen, is secretary of the conference, and the international committee includes Dr. Norton Canfield and Dr. E. P. Fowler jun. (U.S.A.), Prof. E. Luscher (Switzerland), and Mr. C. S. Hallpike (England). The conference will discuss problems connected with the provision and international standardisation of audiometers and hearing-aids.

Faculty of Ophthalmologists

At a council meeting on April 29 the following were elected officers for 1949–50: president, Mr. Frank W. Law; vice-president, Mr. J. J. Healy; hon. secretary, Mr. J. H. Doggart; hon. treasurer, Mr. A. B. Nutt.

It was reported that Dr. Charles Hill had written to the Ministry of Health protesting against the reduction in fee for work under the supplementary ophthalmic service. It was also reported that a letter had been received from the Ministry stating that Mr. W. Penman was willing to undertake an investigation of the average time taken for a sight test, and asking the faculty to nominate four members to watch the investigation and study the results. Mr. Black, Mr. Healy, Mr. Gayer Morgan, and Mr. Simpson have been nominated to represent both the ophthalmic group committee of the British Medical Association and the faculty.

To an inquiry whether a spare pair of glasses should be issued to cover the risk of breakage, the Ministry of Health replied that under the supplementary ophthalmic service and the hospital eye service a patient was not entitled to glasses if already in possession of a pair.

The council was asked by the Joint Committee for Consultants to draw up criteria for consultants and specialists for the specific purpose of assisting those considering appeals from the decisions of the review committees. It was agreed that (1) consultants should have ten years' approved training and experience in ophthalmology in all its branches after qualification; (2) consultants must hold a higher degree or diploma; and (3) consultants must hold or have held a recognised appointment to a hospital.

A letter was received from the Ministry giving the terms of reference and constitution of the proposed committee on the registration of opticians.

Specialist Services in Private Maternity Homes

The Ministry of Health has announced that, as part of the domiciliary specialist service, visits by obstetricians and pædiatricians will in future be available in an emergency for women admitted for confinement to a private maternity home, and for their babies.

Albert Howard Foundation of Organic Husbandry

Dr. A. Guthrie Badenoch will deliver a lecture to the foundation at the Royal Society of Arts, 6, John Adam Street, London, W.C.2, on Tuesday, June 21, at 5 P.M. He is to speak on Minerals in Nutrition. Prof. Wilfrid Newcomb will be in the chair, and there will be a discussion after the lecture. No tickets are required.

Health Services in Northern Ireland

The number of people registered under the Northern Ireland health scheme now exceeds 1,200,000 and represents about 95% of the population. During the first nine months of the scheme about 230,000 people received dental attention, which is equivalent to more than 20% of the people in a full year. In the same period pharmacists dealt with 2,800,000 prescription forms containing nearly 4 million prescriptions.

Education of Maladjusted Children

The second international congress on this subject will be held at Amsterdam from July 18 to 22, when the following subjects will be discussed: sensory defectiveness, feeble-mindedness, difficult children, and one-sided aptitudes. Further information may be had from Dr. Berthold Stokvis, hon. secretary, Museum Flat, Weteringplantsoen 2C, Amsterdam, Holland.

Closed Areas

The Medical Practices Committee are considering reports furnished by executive councils, and are inviting the views of these councils and of local medical committees on the classification of their areas. So far the committee have declared Bournemouth a closed area and have confirmed the previous closure of Hastings.

West London Medico-Chirurgical Society

At the 58th annual dinner, held on May 18 at the Royal College of Surgeons, Lord Burghley spoke gaily and warmly of the President and the Society. Dr. W. S. C. Copeman, responding as cheerfully, said that the society, founded in 1856, had reached a very respectable middle age; in the past year attendances had doubled, thanks partly to an influx of members from the Postgraduate School of London. Lord Moran, P.R.C.P., introduced the recipient of the society's triennial gold medal, Prof. R. A. McCance, F.R.S., of Cambridge, whose experiments on the lowest diet compatible with health had (he was told by undergraduates) been closely studied by the authorities of their colleges. Professor McCance accepted the medal as a tribute to the value of experimental medicine—fittingly given at a place associated with one of its greatest exponents, John Hunter. The name of experimental medicine was coined by Claude Bernard, who was clear that no experiment should be done on a patient except with the direct object of benefiting that patient. Since then the subject had developed, bringing new responsibilities and divided loyalties: the experimenter's interest lay in his problem, but his loyalty was to his patient. The only solution was to make the patient his ally, joining in the research. The worries peculiar to doctors working with the human being by the experimental approach were not always understood by the ordinary practitioner and laboratory worker. Experimental medicine was not all fun, and he appreciated all the more this recognition from other branches of the profession. Dr. Doyne Bell, proposing The Guests, said that young doctors no longer felt that the 18 months they spent in the Services were time wasted; and this was largely thanks to the medical heads of the Services. He recalled that Edward Jenner belonged to two societies, which he called the Convivio-medical and the Medico-convivial; and vaccination had been canvassed at both. Mr. Norman Birkett, the society's Cavendish lecturer, expounded and illustrated the art of replying for the guests; and Mr. Somerville Hastings, M.P., as a governor of the new teaching hospital formed by the West London Hospital, the Hammersmith Hospital, and St. Mark's Hospital, expressed his faith in their united future.

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Royal Medical Foundation of Epsom College

The following pensions and scholarships are available:

"Hadlow" Pension (£70 *p.a.*) for a doctor or the widow of a doctor fully 60 years of age.

St. Anne's Scholarships (one or two) for girls attending Church of England schools; candidates must be fully 9 years of age and the orphan daughters of medical men who have been in independent practice in England or Wales for not less than 5 years.

Pensions for medical men fully 55 years of age, for their widows (60 years of age), and for their spinster daughters (55 years and upwards).

Scholarships and grants for boys and girls, not necessarily orphans, of public-school age who need such help.

Grants from the Eastes Trust for the relief of registered members of the profession of any age, their widows, and orphans, and for the education of their daughters or sons.

Full information and forms of application are available from the secretary, Epsom College, Surrey.

Training of Matrons for Old People's Homes

The National Old People's Welfare Committee is arranging a course for the training of existing staff for old people's homes and with a view to selecting matrons with whom students might be placed for training. The course will be held from Sept. 11 to 17 in London, and it will include lectures and visits to homes, clubs, and geriatric units. Further particulars may be had from the secretary of the committee, 26, Bedford Square, W.C.1.

National Association for Maternity and Child Welfare

This association is holding a conference at Friends House, Euston Road, London, N.W.1, on June 22, 23, and 24, on the Effects of Recent Social Legislation on Mothers and Children. Speakers will include Mr. Aneurin Bevan, who will make his presidential address at the close of the conference, Dr. Charles Hill, Sir Allen Daley, Dr. E. K. Macdonald, Dr. Nora Wattie, Dr. Barbara Bailey, Dr. Arthur Massey, and Dr. May Baird. Further information may be had from the secretary of the association, 5, Tavistock Place, W.C.1.

Abstracting Services

The Interim Coördinating Committee on Medical and Biological Abstracting Services will meet in Paris from June 1 to 4. The committee, created last year under the auspices of UNESCO, is organising among the services providing medical and biological abstracts a system of coöperation intended to make a methodical and complete medical information service available to specialists. Agencies now represented on the committee are: the *British Medical Journal* (London); the Medical Library Association (United States); the *Abstracts of World Medicine* (London); the *Biological Abstracts* (Philadelphia); the *British Abstracts* (London); and the *Excerpta Medica* (Amsterdam).

Conferences

The Government have been considering—particularly in relation to the economical use of man-power—the attitude to be adopted under present conditions towards the holding of conferences largely attended by members and officers of local authorities. In a circular to these authorities the Ministry of Health says:

> "No doubt these conferences in a number of cases, especially those organised jointly from time to time by the Associations of Local Authorities and their officers, fulfil a useful and necessary purpose in assisting the discussion of common problems which have a practical bearing on the development and efficiency of the various local government services, and the Minister would not wish to suggest their discontinuance, either permanently or temporarily. Nevertheless, it appears to him that the number of conferences now held is much too large, that many of these take up too much time and that in the aggregate they make in existing circumstances too great a demand on the time of members and officers alike. It would in his view be appropriate that some of these conferences should be attended by smaller numbers, that some should be held at less frequent intervals and that some of them should occupy a shorter time than has become customary."

Councils are asked to ensure that representatives are sent "only to those conferences attendance at which is desirable in the interests of the council" and that the number sent is no more than is sufficient for this purpose. In so far as councils are consulted about the fixing of conferences, the Minister hopes that they will use their influence to limit their duration and to see that they are held in places which are reasonably accessible. "Where his sanction is required the Minister would not feel justified, save in very exceptional circumstances, in sanctioning payment for sending representatives to conferences held abroad."

Anti-tuberculosis Plan for Switzerland

A referendum is being held in Switzerland on a controversial new measure to make X-ray examination and treatment of tuberculosis compulsory. The measure provides, according to B.U.P., for the periodic examination of the whole population, for compulsory insurance of the poorer classes against the "economic effects of tuberculosis," and for compulsory removal to an isolation hospital of those found to have open infection.

Changes in the Hospital Eye Service

Hospital authorities have been notified that reversible frames and frosted and chevasse lenses may now be supplied without charge under the National Health Service; while laminated safety lenses have been included in the range of special glasses for which the patient is normally required to contribute part of the cost. Where clinically necessary the hospital eye service may now provide and repair free of charge glasses not detailed in the statement specifying fees, &c.; and the service may also provide and repair without charge glasses for which the patient is normally required to contribute part of the cost, when these are, in the ophthalmologist's opinion, clinically necessary.

Prof. G. Grey Turner has been elected an honorary fellow of the American Surgical Association.

This year Dr. Joseph Lilienthal, jun., associate professor of medicine at Johns Hopkins Hospital, has been appointed visiting physician from America at Guy's Hospital. His surgical colleague is to be Dr. Mark Ravich, whole-time surgeon on the staff of the Johns Hopkins in Dr. Blalock's department. They will both arrive in this country on June 1. These exchange visits are made possible through the generosity of the Worshipful Company of Clothworkers.

CORRIGENDUM: *Conference of Hospital Librarians.*—Under this heading last week (p. 893) we correctly quoted an article by Mr. J. L. Thornton, but incorrectly attributed to him remarks made at the conference, which he did not attend.

Diary of the Week

MAY 29 TO JUNE 4

Monday, 30th

UNIVERSITY OF LONDON
5 P.M. (Institute of Neurology, National Hospital, Queen Square, W.C.1.) Prof. H. Olivecrona (Stockholm): Arteriovenous Aneurysms of the Brain.
5.15 P.M. (University College, W.C.1.) Prof. A. V. Hill, F.R.S.: Muscular Contraction. (First of three lectures.)

Tuesday, 31st

UNIVERSITY OF LONDON
5 P.M. (Institute of Neurology.) Prof. H. Krayenbühl (Zürich): The Hemiplegic Patient as seen by the Neurosurgeon.

INSTITUTE OF DERMATOLOGY, 5, Lisle Street, W.C.2
5 P.M. Dr. H. J. Wallace: Lupus Erythematosus.

WESTMINSTER MEDICAL SCHOOL, Horseferry Road, S.W.1
5.30 P.M. Mr. G. T. Mullally: Appendicitis. (Clinicopathological meeting.)

MEDICAL SOCIETY FOR THE STUDY OF VENEREAL DISEASES
5.10 P.M. (1, Wimpole Street, W.1.) *Joint meeting with section of experimental medicine of the R.S.M.* Dr. J. Earle Moore (Baltimore): Recent Advances in the Study of Venereal Diseases.

ST. MARY HOSPITAL MEDICAL SCHOOL, W.2
5 P.M. (Wright-Fleming Institute.) Mr. F. C. Bawden, F.R.S.: Nature of Plant Viruses.

Wednesday, 1st

MEDICO-CHIRURGICAL SOCIETY OF EDINBURGH
8.30 P.M. (Royal College of Surgeons, 18, Nicolson Street.) Dr. Douglas Guthrie: In Quest of the Invisible.

Thursday, 2nd

UNIVERSITY OF LONDON
5 P.M. (Institute of Neurology.) Prof. A. M. Boyd: Intermittent Claudication.

ST. GEORGE'S HOSPITAL MEDICAL SCHOOL, S.W.1
4.30 P.M. Dr. Denis Williams: Neurology lecture-demonstration.

HONYMAN GILLESPIE LECTURES
5 P.M. (University New Buildings, Teviot Place, Edinburgh.) Dr. James Innes: Chemotherapy in Reticulosis.

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THE LANCET

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DEEP PAIN SENSIBILITY *

J. H. KELLGREN
M.B. Lond., F.R.C.S., M.R.C.P.
CLINICAL DIRECTOR, THE RHEUMATISM RESEARCH CENTRE, MANCHESTER UNIVERSITY

THE phenomena of pain belong to that borderland between the body and soul about which it is so delightful to speculate from the comfort of an armchair but which offers such formidable obstacles to scientific inquiry.

Pain is purely subjective. It cannot be measured or photographed or reduced to equations. Indeed one may wonder if it is at all accessible to scientific inquiry; but the value of a scientific experiment depends not on the units in which the result is expressed but on the degree to which the result is reproducible, and therefore predictable and generally applicable. In experiments designed to investigate pain the result is usually a painful sensation; but though most experimental procedures give excellently reproducible results in terms of sensory experience, the subject of the experiment has the greatest difficulty in describing what he feels. If the results of these experiments are to be communicated to other people and compared with the results of other experiments, some form of verbal or diagrammatic record is essential. The translation of sensory experience into words is therefore of vital importance.

Each individual's conception of pain is made up of his own personal experience together with such accounts of the pain of disease as other people can give him, and the reports he may read of other people's observations and experiments. But in the last analysis we can only understand pain in terms of our own experience of this sensation; so the statements and reports of other people are only useful in so far as they can be translated into our own sensory experience.

The student of pain must therefore be his own guinea-pig and must enlarge his personal experience by repeating on himself as many as possible of the previously reported experiments. This painful apprenticeship is not without reward, because he will soon realise the appalling confusion which has arisen through careless and inaccurate translation of sensory experience into words.

CLASSIFICATION OF PAIN

Certain attributes of pain are easily described. Thus we can state that pain is present or absent; we can describe its distribution in terms of main locus and spread or irradiation; we can state whether it is slight or severe, continuous or intermittent, and describe in these terms its time-intensity curve and its relation to other phenomena, such as movement and rest. But can all the apparent differences between one pain and another be described in terms of distribution and time intensity, or are there also differences of quality?

Let us consider a few terms which are widely used in supposedly scientific publications. We often read about "pricking" pain. This presumably resembles the sensation produced by a needle pricking the skin; the pain is therefore punctate in distribution and of short duration and moderate intensity. "Burning" pain is another favourite. This presumably resembles the pain produced by burning an area of skin and is therefore diffuse, continuous, and of considerable severity. So far so good, but what of aching pain? This term is also used for continuous diffuse pain. So how does a burn differ from an ache? Not content with such simple words the more ambitious investigators have introduced terms to suit their special theories, and thus we read about "sympathetic" pain, "vasospastic" pain, "protopathic" pain, and even "peculiarly unpleasant" pain, but have these statements any meaning in terms of sensory experience?

The question of the quality of pain was thoroughly investigated by Lewis (1938). Working on himself and other trained observers he concluded that there were two distinct qualities of pain, one arising from the skin and the other from the deep tissues. You may confirm this on yourself by pulling a few hairs or pinching the skin on the dorsum of the hand, and comparing the resulting pain with that produced by squeezing the muscles of the hand in the first interosseous space. Apart from the obvious difference in quality between these two pains you will note that the pain which results from stimulating the skin is felt on the surface of the body, "in the skin," whereas the muscle pain is felt deep inside the hand, with a distribution which is three-dimensional. In Lewis's original experiments the muscular, ligamentous, and periosteal pains were always more diffuse than the skin pain, and Feindel et al. (1948) have suggested that the different quality of deep pain is entirely due to its being diffuse. But diffuse skin pain produced by injecting irritant chemicals into the skin still retains its cutaneous quality.

In general, skin pain is described as burning and deep pain as aching, but it is preferable to use the terms cutaneous and deep because they can be discussed with reference to a common sensory experience such as the skin pinch and the muscle squeeze, thus avoiding confusion.

Unfortunately, cutaneous pain is not a single entity. A needle prick in normal skin produces an immediate pain of short duration followed after a variable interval by a delayed pain of longer duration. In the toes the interval between the immediate and the delayed pain is nearly 2 sec., whereas in the fingers it is about 1 sec., and on the face and the trunk the interval is so short that both responses are fused into a single pain. From the clinical studies of Lewis and Pochin (1937) and the electrical studies of Zotterman (1939) it has become clear that these two pain responses travel up fibres which have different conduction-rates. The fibres mediating delayed pain have a conduction-rate of about 1 metre per sec., which explains the time interval between the stimulus and the appreciation of pain, whereas the other pain fibres are such fast conductors that the sensation follows the stimulus immediately. In discussing skin pain we should therefore distinguish between the delayed and immediate responses. This is important because the delayed pain response has a component of itch which gives it a distinctive quality, often described as "stinging."

Studies of pain sensibility in nerve blocks (Kellgren and McGowan 1948) have shown that deep pain as well as the immediate and delayed skin pain responses can be clearly dissociated (see table); hence, in the peripheral nerves at any rate, deep pain and the two forms of cutaneous pain are probably mediated by different types of nerve-fibre. This further strengthens the case for classifying pain into these three types. The sensation

ORDER OF PARALYSIS OF FIBRES IN NERVE BLOCKS

Cold block		Pressure block		Procaine block	
Cold		Touch		Vasomotor	
	Deep pain	Pressure	Pressure	Cold	
Motor		Motor		Warmth	
Vasomotor		Cold		Skin pain	Deep
Immediate skin pain		Immediate skin pain		Deep pain	pain
Touch		Warmth		Motor	
	Pressure		Deep pain	Pressure	Pressure
Delayed skin pain		Deep pain		Touch	
Warmth		Delayed skin pain			
		Vasomotor			

The left-hand columns represent the results of previous observers (Bickford 1939, Lewis and Pochin 1938, and Heinbecker et al. 1934). The right-hand columns show the relative positions of deep pain and deep pressure as determined in our own experiments.

* An address delivered to the Manchester Medical Society on Dec. 1, 1948.

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of itch follows the delayed skin pain response in dissociation experiments (Bickford 1938; Rothman 1943), which suggests that itch may be delayed skin pain of low intensity.

Both deep and cutaneous sensibility to pain can be abolished in the appropriate limb by section of the spinothalamic tracts. All pain impulses therefore normally travel up these tracts. Neurosurgical experience has shown that by dividing these tracts it is easy to produce a complete and permanent loss of sensibility to warmth and cold, but it is more difficult to produce a permanent loss of sensibility to pain, particularly pain arising from the deep structures (Jefferson 1948). Whether this is simply due to the pain fibres being more widely scattered in the cord or to alternative pathways which take over their function is not yet clear. The fact that complete transection of the cord leads to complete and permanent analgesia below the appropriate level (Guttmann 1947), even in those cases of lower lumbar transection where the sympathetic supply to the legs remains largely intact, suggests that if an alternative pathway exists it is certainly not an extramedullary pathway through the sympathetic chain. This view is supported by the fact that sympathetic denervation of a limb does not give rise to any detectable alteration in deep or cutaneous sensibility (Lewis 1942). It is generally agreed, however, that the efferent pain fibres from the viscera pass through the sympathetic chain on their way to the posterior roots (Lewis 1942, White and Smithwick 1944), and there must be some point in the limb girdles where this "visceral" pathway is replaced by the more direct pathway through the peripheral nerves, and through this kind of overlap structures such as the femoral artery might remain sensitive in a paraplegic; but it is clear that from the main bulk of the limbs both the deep and cutaneous pain fibres follow the orthodox pathways in the peripheral nerves and the spinothalamic tracts.

If we add deep pain together with immediate and delayed skin pain to our vocabulary we can describe most pains that can be produced in the normal person, but we still cannot describe some of the abnormal pains of disease, particularly the abnormal pain response found in injuries of the peripheral nerves and other disturbances of the pain pathways. Head and Rivers (1905) called this abnormal response protopathic, and Foerster (1927) talks of hyperpathia. More recently Weddell et al. (1948) describe such pain as unpleasant. But what do all these words mean in terms of sensory experience? Only Trotter and Davies (1909) came near to a translatable expression when they spoke of "sensory enhancement."

If graded stimuli are applied to normal pain receptors, the subject experiences a gradation of sensations. Bishop

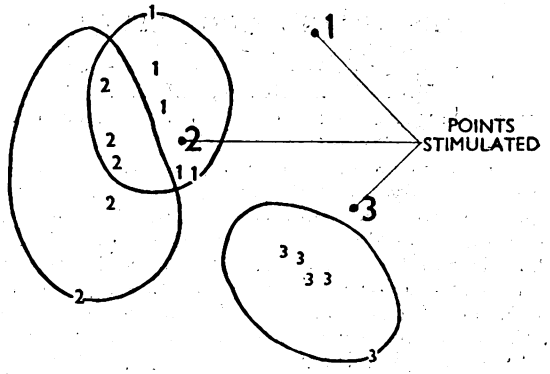

Fig. 2—Pain arising from points 1, 2, and 3 on gluteal fascia 4 cm. apart. Small numerals show where momentary pain from corresponding needle was placed. Circles indicate limits of pain from saline solution injected at same points. Skin localisation was accurate to within 1 cm.

(1943, 1944), using electrical stimuli applied to pain receptors in his own skin, found that a weak stimulus produced a sensation which he called "contact"; but, when the strength of the stimulus was increased, the resulting sensation was changed to what he called "pricking," and finally to "pain." But throughout this gradation the sensation remained distinct from touch, warmth, or cold; hence, the "contact" and "pricking" of Bishop appears to be skin pain of low intensity. A similar gradation of sensation results from graded mechanical stimuli.

In studying pain sensibility in nerve injuries and nerve blocks of gradual onset we have found that this sensory gradation may be so lost that a graded stimulus gives rise to severe prolonged pain immediately the stimulus reaches the original threshold for Bishop's "pricking" (Kellgren and McGowan 1948). This explosive exaggerated response is a very striking phenomenon, and it occurs in both immediate and delayed cutaneous pain and to a less extent in deep pain. The sudden unexpected severity of the pain is most remarkable, and it is probably this attribute of pain which has given rise to such special terms as "protopathic" and "peculiarly unpleasant."

It is therefore useful to state whether pain has a normal threshold and gradation or an abnormal threshold with an explosive exaggerated response. The pain threshold can further be defined in terms of the threshold of perception of pain, which varies very little from person to person, and the threshold of reaction to pain, which varies greatly in different persons and different circumstances (Wolff and Goodell 1943, Schilling and Musser 1948).

Our pain vocabulary is now quite large. We may describe pain in terms of distribution and time intensity,

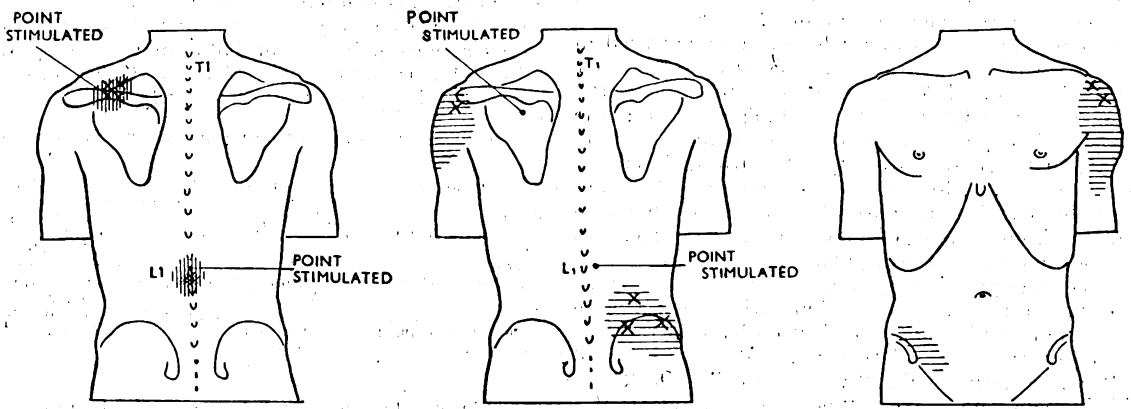

Fig. 1—Distribution of pain produced by saline solution from subcutaneous periosteum (vertical hatching) and deeply situated periosteum (horizontal hatching). Points stimulated are tip of spine and lamina of first lumbar vertebra and spine and infraspinous fossa of scapula. Crosses indicate where pain was located when the periosteum at site of injection was scratched with needle (3 observations). (This and subsequent figures are reproduced by the courtesy of *Clinical Science*.)

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in terms of deep pain and skin pain, and we can further distinguish between the immediate and delayed skin pain response, which includes itch; and finally we can state whether the threshold is normal or abnormal and whether there is a normal sensory gradation to a graded stimulus or an explosive exaggerated response.

Though these terms may not appeal to the imagination, they all represent phenomena which can be readily reproduced in any person; hence they can be translated back directly into actual sensory experience. This is a tremendous advantage, since it reduces the confusion produced by variations of translation to a minimum, and such variations of translation have probably been the chief cause of the confusion and obscurity which impede the progress of knowledge in this difficult field.

CHARACTERISTICS OF DEEP PAIN

If deep pain is to be regarded as a separate entity it should have certain characteristic attributes. During the past twelve years we have carried out many thousands of clinical and experimental observations on pain sensibility. A few of these observations have been recorded in detail elsewhere (Kellgren 1938, 1939, 1941, Lewis and Kellgren 1939, Kellgren and McGowan 1948); but though the remainder were not thought to be of sufficient importance to be recorded in detail they have allowed us to formulate the following general conclusions.

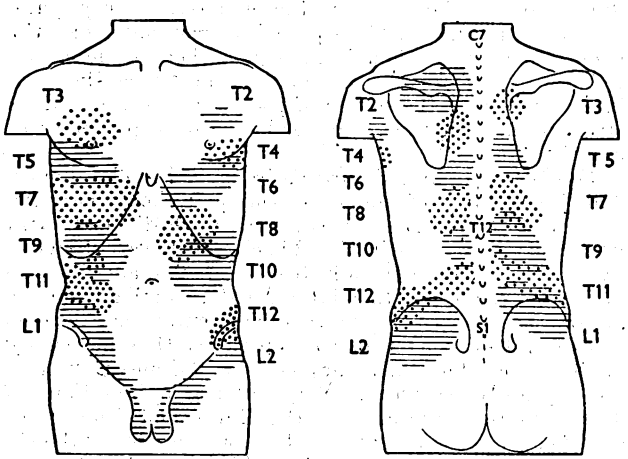

Fig. 3—Distribution of pain arising from deep structures of spine at level of T2-L2. Alternate areas hatched and stippled.

Pain Sensitivity

Pain can be produced from the deep tissues by mechanical stimuli. Exploring the tissues with needles passed through anæsthetic skin, and the application of pressure with a blunt pressure algesiometer, are convenient methods of investigation. The injection of chemical solutions, such as 6% saline solution, and rapid cooling of the deep tissues are also effective stimuli. These are particularly useful because they give rise to a continuous pain which resembles more closely the pain of disease than does the momentary pain produced by exploration with needles.

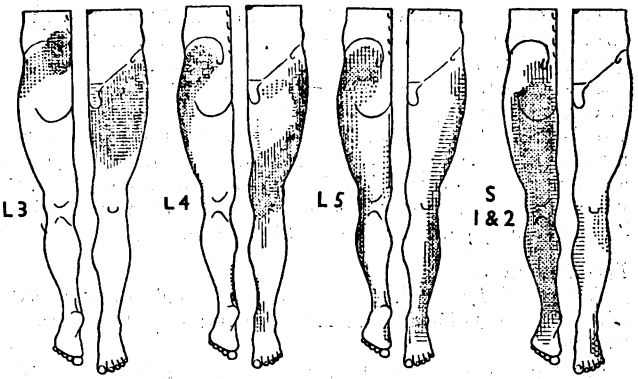

Fig. 5—Distribution of pain arising from deep structures of spine at levels L3-S1.

The somatic deep structures vary greatly in their pain sensitivity to these stimuli. Some structures, such as subcutaneous deep fascia, periosteum, capsules of joints, and sheaths of nerves and blood-vessels, are highly sensitive. The muscles are less sensitive, and articular cartilage and compact bone give rise to a sensation of pressure only, when stimulated, and are apparently insensitive to pain.

When the less sensitive structures, such as muscle, are explored with needles, most of the tissue gives rise to no sensation, but a few sensitive spots can be found which give rise to severe pain. In the more sensitive tissues these pain spots are more numerous. The sensitivity of different tissues also varies with their situation. Thus the periosteum on the subcutaneous surface of the tibia is almost everywhere sensitive to the needle, whereas in the periosteum of the lateral aspect of the tibia there are roughly three sensitive zones: one near its subcutaneous border, one near the interosseus membrane, and a third irregularly distributed between these two but with considerable intervening insensitive areas up to 1 cm. in diameter. In the periosteum of the infraspinous fossa of the scapula pain spots are infrequent, there being only two or three sensitive areas about 1 cm. in diameter surrounded by wide areas of insensitive periosteum. But some deeply placed tissues, such as the capsules of the hip and shoulder joints, have numerous pain spots and are highly sensitive. In general one may say that under the skin there is a second highly sensitive layer composed of deep fascia, periosteum, and ligament, and that beneath this layer the deep tissues are less sensitive, with certain notable exceptions, such as the joint capsules.

The work of Woollard (1936, 1940) has established the undifferentiated nerve nets as the receptors for cutaneous pain. Weddell and Harpman (1940) and Feindel et al. (1948) have demonstrated similar nerve nets in the deep tissues, and it seems probable that these represent the deep pain receptors, though this has not yet been proved by direct stimulation in man. Structurally these deep

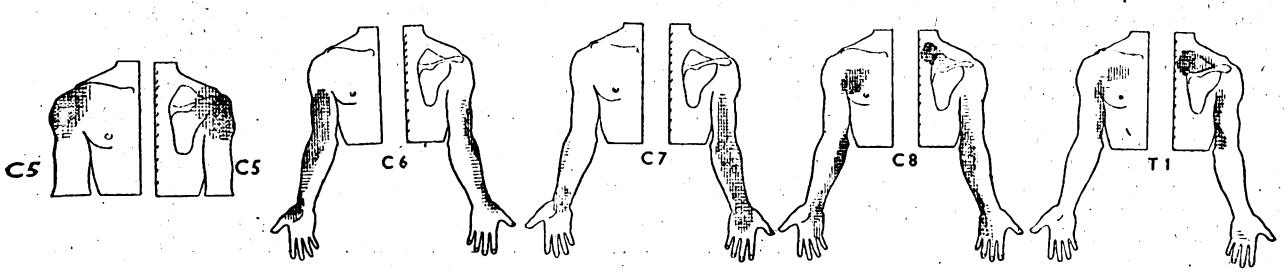

Fig. 4—Distribution of pain arising from deep structures of spine at levels C5-T1.

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nerve nets resemble closely those found in the skin, but they are much less numerous and are only found infrequently in those relatively insensitive structures in which pain spots are scarce. It is therefore probable that the varying sensitivity of the deep structures results from a varying density of innervation. Several of these pain nets may be supplied by a single branching axon, so that one axon may innervate a sizable portion of tissue—a fact which has an important bearing on the function of the localisation of pain (Sinclair et al. 1948b).

Localisation

A striking feature of deep pain is the varied accuracy with which it is localised. A few examples will illustrate this point.

Fig. 1 shows the result obtained from stimulating superficial and deeply placed periosteum. It will be seen that pain arising from subcutaneous periosteum is confined to the neighbourhood of the point stimulated, whereas pain arising from deeply situated periosteum is felt diffusely and may be "referred." It will also be noticed that, when the injection of saline solution gives rise to pain which is more or less local, the momentary pain produced by the needle-point is regularly placed at the same spot; but that, when saline solution gives rise to diffuse "referred" pain, the pain produced by the needle-point is placed in various situations but always somewhere within the distribution of the pain caused by the saline solution.

Fig. 2 illustrates the distribution of pain arising from deep fascia. It will be seen that the pain produced by saline solution is not felt diffusely but is confined to a small region, and that the pain produced by the needle-point is regularly placed within the distribution of the corresponding pain caused by the saline solution. The pain, however, is not always placed over the point stimulated. On the other hand it is not felt at any great distance from that point; so, though this pain is not accurately localised to the point stimulated, it may be called local as distinct from diffuse in distribution.

These experiments were carried out on a blindfold person, who indicated the site of pain with his finger. But if the subject watches the experiment and is simply questioned he will state that pain is felt accurately at the site of the needle, though when blindfold he cannot distinguish between stimulation of points 1 and 2 in fig. 2. In the experiments shown in fig. 1 the subject may state that the pain is felt "at the site of the needle," even when he points to the buttock as the site of the pain; but, when the pain is felt in the shoulder, he realises it is remote from the needle because he can see that there is no needle in the shoulder region. Thus the greatest care must be taken in experiments of this kind to avoid erroneous conclusions about localisation. The distribution of pain is also affected by its intensity. Thus very severe pain tends to have a full segmental distribution, whereas pain of slight intensity has a modified segmental distribution, being felt in only part of the segment, usually that nearest the stimulus.

All the structures situated deeply within the centre of the trunk and limb girdles give rise to diffuse segmental pain, and, with the spinous processes as a rough guide to segmental level, the deep structures in the region of each vertebra have been stimulated and the resulting segmental distribution of deep pain ascertained (figs. 3–5).

Structures lying less deeply give rise to pain whose segmental distribution is modified by a crude attempt at localisation. For instance, pain arising from the erector spinæ muscle is felt more in the back than in the front, whereas pain arising from the rectus abdominis muscle is felt more in the front than in the back. The segmental distribution of pain arising from the limb muscles and joints is modified to an even greater extent.

This phenomenon of faulty localisation is usually spoken of as "referred pain," and many ingenious mechanisms of reference have been postulated.

Since Henry Head (1893) described the areas of cutaneous hyperalgesia occasionally found in visceral disease it has been widely assumed that these areas of cutaneous hyperalgesia represent the same phenomenon as deep pain of segmental distribution, and the pain is therefore said to be referred to this or that dermatome; but this is a gross misconception. The pain which results from stimulation of the infraspinous fossa (fig. 1) is felt deeply in the muscle, bone, or joint of the shoulder and is never misinterpreted as pain arising from the skin over the shoulder, and throughout the duration of the pain the deep tissues in the shoulder regions are slightly tender, but cutaneous sensibility remains generally unchanged; but, when the pain is very severe indeed, a cutaneous pinprick may appear to be slightly dulled by the intensity of the underlying deep pain. The pain is thus misinterpreted as coming from the deep tissues of the shoulder, and it is therefore nonsense to speak of reference to a dermatome, since the misinterpretation of the source of pain is between one deep structure and another, and not between deep structures and the skin.

This is true of all pain arising from the muscles, bones, and joints, and of much of the pain accompanying visceral disease. But in some visceral diseases, and when the viscera are stimulated in certain ways, cutaneous hyperalgesia may develop instead (McLellan and Goodell 1943), and the pain is then interpreted as coming from the appropriate area of skin. When cutaneous hyperalgesia and deep pain appear separately they are easily distinguished, but when they occur simultaneously they are naturally confused. Very intense stimulation of deep somatic structures in the limbs and back may occasionally produce areas of cutaneous hyperalgesia as a delayed phenomenon, but this is rarely, if ever, encountered clinically.

Widespread cutaneous hyperalgesia also results from stimulation of the skin itself. This phenomenon was fully studied by Lewis (1936) and later by Harpman (1948), and both of them agree that this cutaneous hyperalgesia is produced by a peripheral neural mechanism in the skin, and the structure of the pain nets with their branching axons seems admirably suited for such

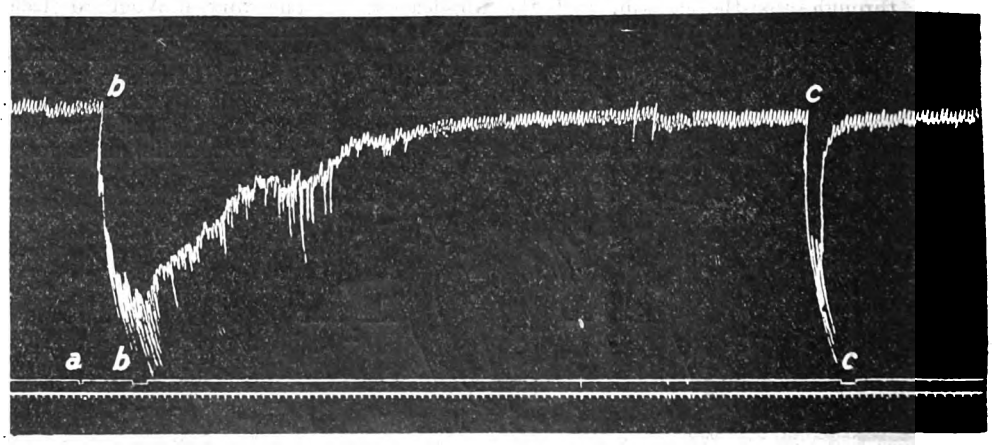

Fig. 6.—Contractions of abdominal muscles of cat: *a*, insertion of needle into back muscles; *b*, injection of 0·1 ml. of 10% saline solution; *c*, pinch of back muscles.

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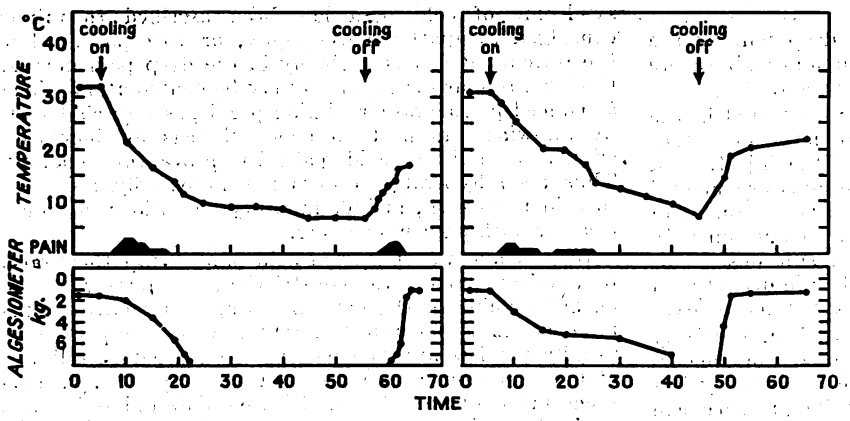

Fig. 7—Left, result of cooling ulnar nerve at elbow. Temperature was recorded with a thermocouple lying on deep fascia by nerve; spontaneous deep pain in the hand is shown in black; deep pain sensibility was tested on dorsum of hand over 4th interosseous space with pressure algesiometer. Right, result of cooling subcutaneous surface over tibia; thermocouple was placed on periosteum, and deep pain sensibility was tested with algesiometer applied to centre of cooled area.

a mechanism. But how stimulation of the viscera gives rise to cutaneous hyperalgesia is still uncertain.

Local anæsthesia of the skin abolishes cutaneous hyperalgesia, but it has no effect on falsely localised deep pain. But, if the deep tissues in which the pain is felt are anæsthetised, the slight deep tenderness accompanying the pain is abolished, and the pain may be reduced in intensity or it may move to adjoining deep structures. If the pain is at all severe, however, it will continue to be felt within the anæsthetic tissues. Both Harman (1948) and Cohen (1947) have also shown that deep pain may be misinterpreted as coming from a phantom limb. It is therefore probable that the false localisation of deep pain results from a central misinterpretation of its source.

The function of sensory localisation has two distinct components: there is the power to distinguish between two stimuli, which is often referred to as two-point discrimination; and there is also the power of placing the origin of a sensation in space. In the skin of the normal adult hand both of these functions are highly developed; but, if the density of the functioning innervation of the hand is reduced—e.g., in an ulnar nerve block, in which all forms of sensibility have been lost except delayed skin pain—discrimination becomes very defective. In this condition two-point stimuli are only recognised as separate when they are about 10 cm. apart. The pain, however, does not become diffuse and segmental but continues to be felt locally in the skin, being recognised as coming from the finger or the palm of the hand, though it cannot be placed more accurately.

There is no doubt that discrimination and accurate localisation require a certain density of innervation, but how do we decide whether a given pain is arising from the hand and not from the foot or somewhere outside the body? This placing of a sensation is clearly a complex phenomenon and must depend on our awareness of space and the position of our body within space. The newborn infant is probably unaware of the existence of its limbs or of their position in space, but as a result of a mass of tactile proprioceptive and visual experiences body consciousness is acquired, and the adult has a fully developed plastic body image. Though the skin and the more obvious deep structures, such as the peripheral limb joints, are clearly represented in the body image, structures lying deeply inside the trunk and limb girdles are not represented at all. We are, for instance unconscious of the existence of the body of the second lumbar vertebra, though we are aware of the tip of its spinous process. We think we know where our kidneys are situated, but a pelvic kidney is not recognised as such by its possessor. It must surely be obvious that we cannot place a sensation in a given structure when we are not aware of its position in space, or even of its existence, and we therefore place sensations arising from structures of this kind in other neurologically related structures which are well represented in our body image.

In certain diseases of the central nervous system the localisation of pain may become very defective, and the pain from a single pinprick may spread widely over the body, suggesting a central breakdown of localisation. It is therefore probable that many factors are involved in the localisation of pain, and we should avoid trying to explain all the phenomena in terms of one mechanism and should certainly consider cutaneous hyperalgesia and deep pain separately.

False localisation undoubtedly results from the stimulation of sensory fibres in continuity at some point between the appropriate receptors and the brain. When a mixed nerve-trunk is stimulated in this way, the subject experiences both deep and cutaneous sensations simultaneously; this can easily be demonstrated by electrical or mechanical stimulation of nerve-trunks or by the injection of chemical solution, such as 6% saline solution, directly into a nerve. Such chemical injections must be most accurately placed, since merely to surround a nerve with hypertonic saline solution is ineffective, as can be shown by introducing 0·5 ml. of 6% saline solution into the ulnar groove at the elbow. Sinclair et al. (1948a) suggest that injections of 6% saline solution into the back normally give rise to falsely localised pain by this mechanism. At first glance this would seem reasonable upon anatomical grounds, but these workers did not appreciate the accuracy with which such injections must be placed within a nerve-trunk to stimulate fibres in continuity. Besides, the mixed sensations that result from stimulating the fibres contained in a nerve-trunk are characteristic and quite unlike the pain produced by stimulating other deep structures.

This fact is of great value clinically in helping to distinguish between diffuse pains due to the stimulation of the fibres of a nerve-trunk in continuity from falsely localised deep pain, and from the areas of cutaneous hyperalgesia described by Head (1893) and Lewis (1936).

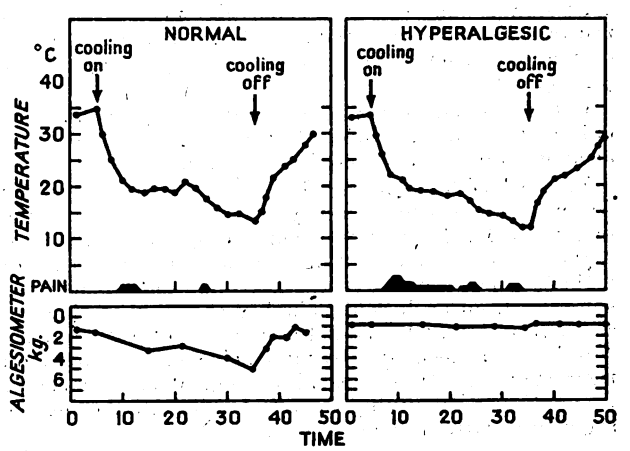

Fig. 8—Result of rather slower and less complete cooling of both normal and hyperalgesic periosteum in same person.

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Muscular Reflex

One of the interesting features of deep pain is the segmental muscle spasm which accompanies all severe deep pain of more than momentary duration.

This muscle spasm can easily be demonstrated in the trunk, where stimulation of the deep structures of either the front or the back of the body by the injection of irritants, such as 6% saline solution, produces segmental pain and striking rigidity of the appropriate segment of the abdomen or chest wall. The rigidity comes on with the pain and disappears as the pain subsides. This segmental muscle spasm has been studied in decapitated cats (fig. 6) and is probably produced by a spinal reflex.

In the limbs the segmental musculature is more widely distributed, with the result that muscle spasm appears as widespread fine fasciculation, which is clinically less obvious than abdominal rigidity, but its presence can be clearly demonstrated by electromyography. Thus in an experiment such as that shown in fig. 1, where stimulation of the intraspinous fossa gives rise to shoulder pain, electromyographic recordings from the deltoid muscle reveal continuous motor unit activity throughout the duration of the pain.

Recent electromyographic studies in various painful diseases, such as sciatica (Elliot 1944) and rheumatoid arthritis (Morrison et al. 1947), have revealed this type of muscle spasm, and its presence has been used to support the view that the disease in these cases is primarily neurogenic. But, if spontaneous deep pain is present, active motor units will certainly be found in appropriate muscles as a result of the spinal reflex, and the only conclusion that can be drawn from these electromyographic findings is that the subject's pain is probably deep, since cutaneous pain is not accompanied by muscle spasms of this type. Of more interest is the possibility that this motor activity may lead to muscle fatigue and so to secondary sources of pain in the affected muscles (Simons et al. 1943).

Cold Pain and Deep Hyperalgesia

In nerve-blocking experiments we noticed that deep pain sensibility was peculiarly susceptible to cooling. Further investigation (Kellgren et al. 1948) showed that, if the normal deep tissues are cooled rapidly, the subject experiences severe pain while the temperature is falling from 30 to 15°C; but, as the temperature falls, deep analgesia develops, to become complete when the temperature of the deep tissues reaches 10°C. Thus in spite of further cooling the pain fades away (fig. 7). With slow cooling, deep analgesia develops without any preceding pain; hence the usual fluctuations of temperature produced by climatic changes give rise to no pain in the normal person. But, if deep hyperalgesia is present even slow cooling of the affected part may give rise to protracted and severe pain, and the analgesia which normally accompanies cooling develops imperfectly (fig. 8).

Cutaneous pain can also be produced by cooling but only at temperatures below 10°C; so cutaneous pain on cooling is rarely seen in clinical practice.

Pain which is produced by cooling and relieved by warmth is a feature of many painful conditions of the extremities, including post-traumatic syndromes, painful nerve injuries, glomus tumours, and many forms of arthritis and rheumatism. Investigation of patients suffering from such cold pain has shown that they all suffer from hyperalgesia of the affected deep tissues, the threshold to mechanical stimuli being greatly lowered; their spontaneous pain is also deep, and when severe it spreads proximally up the affected limb, following the segmental pattern of deep pain.

In some of these cases the affected part is blue and cold, but in others the peripheral circulation is normal. This syndrome of cold pain has been ascribed to minor causalgia, sympathetic dystrophy, or vasospasm; but the primary defect is probably in the deep pain nerves, though vascular disturbances may be contributory, since a reduced peripheral circulation predisposes to cold pain by allowing the part to cool, whereas an increased circulation relieves cold pain by preventing cooling. Thus deep hyperalgesia does not necessarily give rise to cold pain—e.g., in inflammatory conditions in which local warmth prevents cooling.

In patients suffering from cold pain, sympathectomy, by abolishing reflex vasoconstriction, interferes with the normal cooling of the extremities and so relieves spontaneous pain, but unfortunately the deep hyperalgesia usually persists and the patient is only partly relieved of his symptoms; and, as might be expected, sympathectomy is of no value in these patients unless it leads to a substantial and permanent reduction of cooling.

CONCLUSION

Deep pain sensibility has certain attributes, such as characteristic quality, frequent false localisation, associated muscle spasm, and susceptibility to cooling which distinguish it clearly from cutaneous pain.

Deep and cutaneous pain sensibility may also be dissociated; hence it is probable that they are mediated by different types of nerve-fibre.

The clinical syndromes produced by disturbances of deep and cutaneous pain sensibility may differ markedly, and what is true of cutaneous pain is not necessarily true of deep pain. In all clinical and experimental work it would therefore be wise to distinguish between these two main types and to make a further distinction between immediate and delayed skin pain.

To avoid confusion we should define our vocabulary of pain with the utmost care, so that our records may be translated back into sensory experience and become intelligible to other workers in this field.

We still know surprisingly little about pain sensibility and particularly about the genesis of pain in disease, and we should therefore avoid constructing those fascinating diagrams of unorthodox pain pathways and pain mechanisms whose intellectual neatness and completeness belie the facts and discourage further inquiry.

Though much useful information is being gained from anatomical studies of the pain receptors and from electrical studies of action potentials and cerebral activities, the facts most directly relevant to the problems of pain concern the sensory experience itself, and there is still a wide field for both clinical and experimental work at this level.

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LIGATION OF THE COMMON CAROTID ARTERY

REPORT OF 19 PERSONAL CASES

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LIGATION of a carotid artery may produce complications either because of immediate cerebral ischæmia in the territory under its influence or because of delayed embolism or thrombosis from the site of the ligature. These dangers may to a large extent be avoided by ligating the common rather than the internal carotid artery and by section of the artery rather than tying it in continuity (Rogers 1947b).

Quoted statistics of the results of ligation of a carotid artery are often misleading since many of these relate to times when infection was frequent and when the operation was done for aneurysms in the neck, malignant disease, or hæmorrhage, often in elderly and enfeebled patients. In many instances it is not stated which carotid artery was ligated or whether the vessel was divided or tied in continuity. For these reasons statistics of many of the earlier published cases must be rejected.

From an experience of 19 cases in which I have ligated a common carotid artery without mishap (table I), combined with a review of recently published cases, I have no hesitation in stating that in a reasonably fit person, provided the tolerance test is satisfied, it is safe to divide the great vessel in the neck.

On the other hand, an experience of delayed hemiplegia in one case of internal carotid ligation (Parry and Rogers 1939), along with a series of cerebral complications and fatalities in recently published cases of ligation of this artery in the neck, leads me to assert with equal confidence that ligation of an internal carotid artery as a primary procedure is dangerous (table II).

DIVISION OF THE ARTERY

Division of the artery not only severs the accompanying sympathetic fibres and abolishes spasm and prevents recanalisation but also reduces the liability to delayed embolism, since the distal retracted part of the artery, which may contain clot at the site of the ligature, is no longer subjected to the pulse wave, as it must be if the artery is tied in continuity (see figure). It is therefore important to divide the artery between ligatures rather than to tie it in continuity.

THE ACCOMPANYING VEIN

Though a case may be made for ligation of the corresponding vein when the main artery to a limb is secured, no such case holds with the jugulocarotid system. Electro-encephalography at the time of occlusion (Rogers 1947b) shows that cerebral anoxia is increased if the vein is ligated when the artery is tied. When one considers the essential differences between the intracranial circulation and that of the limb, this is not, perhaps, surprising.

TOLERANCE TEST

The tolerance test is done to ascertain the competence of the circle of Willis as an anastomosis (Rogers 1947a and c) to give rise to a collateral blood-supply. The common carotid artery is exposed, under local infiltration analgesia, through a transverse incision in a crease line crossing the anterior border of the sternomastoid and is temporarily occluded with a piece of tape tied round a short piece of rubber tubing. The patient's reactions are noted, dynamometer readings are taken at 3-minute intervals from the opposite hand, and an electro-encephalogram is made of the cerebral activity (Rogers 1944). If at the end of 15–20 minutes no untoward reactions are noted, the artery is divided between silk ligatures and the wound is closed. In only one of my cases (not included here) was the artery released, and possibly this patient would not have been embarrassed in any way by section of the vessel; but, since there was a little doubt about a possible reaction, it was thought advisable not to risk the occlusion.

REASONS FOR COMPARATIVE SAFETY OF LIGATION OF COMMON CAROTID ARTERY

Recent investigations (Rogers 1947a, b, and c) support the view that the circle of Willis is not a distributing

TABLE I—ANALYSIS OF PERSONAL CASES OF LIGATION OF A COMMON CAROTID ARTERY

Case no.	Sex	Age (yrs.)	Side	Date of operation	Reason for ligation	Result	Remarks
1	M	44	R	March 30, 1927	Malignant disease in neck	Satisfactory	..
2	M	51	L	April 4, 1927	" " " "	"	..
3	M	2/52	L	Feb. 22, 1934	Hydrocephalus	"	..
4	M	24	R	April 29, 1944	Intracranial aneurysm	"	..
5	F	51	R	July 28, 1944	" " (leaking)	"	..
6	F	47	L	Sept. 4, 1944	" " (leaking)	"	..
7	M	22	R	July 23, 1945	" " (leaking)	"	..
8	F	39	R	May 24, 1946	" " (leaking)	"	..
9	M	37	R	Aug. 13, 1946	" "	"	..
10	F	46	R	April 14, 1947	" " (leaking)	Satisfactory	In coma at time; died 4 days later; bronchopneumonia
11	M	64	R	Feb. 24, 1948	Carotico-cavernous aneurysm	"	..
12	F	18	L	Aug. 28, 1948	Cortical angioma	"	..
13	F	56	R	Sept. 15, 1948	Subclavian aneurysm	"	Innominate tied Aug. 27, 1948
14	F	48	L	Sept. 28, 1948	Intracranial aneurysm (leaking)	"	Transient hemiplegia lasting only a few seconds at time of ligation
15	F	42	L	Oct. 11, 1948	Hæmangioma of skull	"	R. ext. carotid artery tied Sept. 21, 1948
16	M	25	R	Oct. 11, 1948	Cortical plexiform hæmangioma	"	Int. carotid artery tied Jan. 25, 1932
17	F	55	L	Jan. 14, 1949	Intracranial aneurysm	"	..
18	F	39	L	Jan. 28, 1949	" "	"	..
19	M	39	R	March 8, 1949	" "	"	..

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TABLE II—COMPARISON OF COMPLICATIONS FROM LIGATION OF COMMON AND INTERNAL CAROTID ARTERIES

Source of cases	Common carotid artery			Internal carotid artery		
	No. of cases	Cerebral complications	Deaths	No. of cases	Cerebral complications	Deaths
Personal	19	0	1	2	1	0
Schorstein (1940)	11	0	0	49	11	8
Author's collected	14	1	1	—	—	—
Total ..	44	1	2	51	12	8

station for the cerebral blood-supply but is a potential and singularly constant by-pass type of anastomosis across which the collateral circulation can develop.

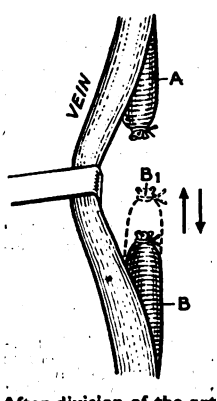
Every ligation of a carotid artery must depend primarily, for absence of disturbance of the cerebral circulation, on the presence and potency of this anastomotic circle, and for this reason it is desirable to carry out the tolerance test.

Division of a common carotid artery reduces but does not completely abolish the flow in the internal carotid arising from it, since there is a free anastomosis across the midline of the neck between the two external carotids (Dorrance 1934, Kerwin 1942, and more recently my own observations have estimated the reduction in blood-flow to about half.)

It is therefore safer to ligate the common rather than the internal carotid artery because the blood-flow is thereby materially reduced but not completely abolished. If it is necessary to ligate the internal carotid artery, this should be done at a later stage following primary division of the common carotid and by resecting its cervical course beyond the site of the ligature. By the preliminary division of the common carotid a collateral circulation through the circle of Willis is given time to develop. Elsewhere (Rogers 1947b) I have shown why, if the internal artery is to be tied, it should be resected up to the base of the skull.

COMMENTS

None of these 19 patients had any permanent cerebral disturbance following the ligation. One of them, who tolerated temporary occlusion well, lost consciousness and developed hemiplegia as soon as the artery was tied and divided. Within a few seconds, however, she recovered consciousness, and her hemiplegia disappeared, suggesting that the reaction was a temporary spasm set up in the artery. A woman, aged 46, with a leaking intracranial aneurysm, died of bronchopneumonia four days after a ligation, but she was already in coma at the time of operation. The ligation arrested the subarachnoid hæmorrhage, and no cerebral signs followed; but the case was a late one, and the patient died of her chest infection. In all except my first 3 cases the artery was divided between ligatures and not tied in continuity. For reasons already stated I consider this most important as a safeguard against complications.



After division of the artery its ends retract and become separated by an appreciable gap. Blood-clot forming in relation to the ligature at A is then no longer subjected to the pulse wave which reaches the closed end of B. The clot at A is therefore unlikely to be shot off by the pulse wave, as it might be if the artery were ligated in continuity and the clot subject to the forward thrust of B with each pulsation of the heart.

If to the 19 cases of common carotid ligation here recorded we add 11 collected by Schorstein (1940), none of which had cerebral complications, and another 13 cases of which I have records, only one of which (a case of dual intracranial aneurysms) had complications, we have a series of 43 common carotid ligations with only one undesirable result. On the other hand, of 2 cases in which I have ligated an internal carotid artery one developed a delayed hemiplegia,* and of Schorstein's 49 collected cases 11 had cerebral complications and 8 patients died (table II).

The conclusion is irresistible that division of the common carotid artery in a reasonably fit person carries little risk of complications, whereas internal carotid ligation is a dangerous procedure and to be avoided as a primary measure.

SUMMARY

Ligation of a common carotid artery is relatively safe in a fit person who satisfies the tolerance test. The artery should be divided, however, and not tied in continuity.

Ligation of an internal carotid artery is dangerous and to be avoided as a primary procedure.

If it is proposed to ligate the internal carotid in the neck, the common carotid should first be divided and then, some weeks or months later, the internal artery resected. By so doing not only is a collateral circulation encouraged to develop in the circle of Willis but also precautions are taken against delayed complications.

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SEROLOGICAL DIAGNOSIS OF HUMAN TOXOPLASMOSIS

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TOXOPLASMA, an intracellular protozoon parasite, was identified in 1909, but only within the last ten years has it been shown to cause human disease. Apart from its exceptionally wide host range little is known about the biology of the parasite or about the epidemiology and incidence of human infections. Toxoplasmosis, in overt or symptomless form, may occur at any age, but most recognised cases have been infants with congenital abnormalities. Hydrocephalus, chorioretinitis, and cerebral calcification are characteristic signs in infants, but diagnosis can be made with assurance only by infecting animals from human tissues, by recognising the protozoon in histological section, or by serological methods. The parasites have rarely been recovered from patients during life, and histological sections are usually available only after death. Serological tests were devised and used extensively by Sabin and his co-workers in America (Sabin 1942) but are technically complicated and have not been generally used here; the complement-fixation method of Warren and Russ (1948) appears to be more suitable. Since cases of toxoplasmosis have now been described in England (Jacoby and Sagorin 1948, Farquhar 1949), tests were made for a simple laboratory method of recognising infection. Two techniques were used, both designed to detect antibody in human serum: a neutralisation test on the chorio-allantois of the developing hen's egg, and the complement-fixation test with antigen prepared from infected chorio-allantoic membranes.

* This case occurred some years ago, and the artery was tied in continuity as a primary procedure. Today I should resect the vessel after preliminary ligation and division of the common carotid artery, and believe there would be less likelihood of cerebral complications. The patient recovered, but incompletely, and was hemiparetic and slightly spastic up to the time of her death ten years later.

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MATERIALS

A strain of toxoplasma of American origin was obtained from Colonel H. E. Shortt and maintained by intraperitoneal injection of mice at intervals of 4 or 5 days. The deposit from a centrifuged sample of mouse peritoneal exudate was inoculated on the chorio-allantoic membranes of developing chick embryos, and this produced lesions on first passage. For the tests described here egg-passaged toxoplasma was used; after several passages this egg-adapted strain no longer caused a fatal infection in mice unless a large dose was given—a finding which differs from recent American experience (MacFarlane and Ruchman 1948). However, comparative serological tests with mouse-adapted and egg-adapted strains of toxoplasma gave similar findings, and it was assumed that the egg-adapted strain could be used for this work.

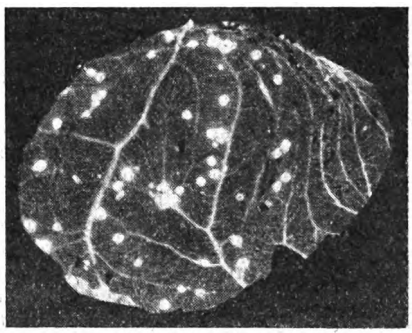
Fertile hens' eggs incubated for 12 or 13 days were used for all tests, but 10-day eggs are also satisfactory. Known positive sera were obtained from the mother of a child with toxoplasmosis in Liverpool, and three other positive human sera were kindly supplied by Dr. Sven Gard, of Stockholm. In addition an immune rabbit serum was prepared by giving at 10-day intervals three intracutaneous doses of toxoplasma obtained from mouse peritoneal exudate, followed by one intraperitoneal dose. "Normal" human sera were obtained from the Public Health Laboratory, Liverpool.

LESIONS ON THE CHORIO-ALLANTOIS

The method of chorio-allantoic inoculation was the standard technique described by Beveridge and Burnet (1946), and eggs inoculated with toxoplasma were subsequently incubated at 37°C for 4 or 5 days. The chorio-allantoic membranes were then removed and placed in petri dishes containing formol-saline, and the lesions were examined with a hand lens. At this stage toxoplasma lesions are well-developed and counts can readily be made. Lesions on the chorio-allantois have been observed following inoculation into the yolk sac (MacFarlane and Ruchman 1948). In preliminary trials it was found that, when falling dilutions of a suspension of parasites were inoculated into eggs, the number of lesions developing on the membranes also fell in roughly the expected proportion. Even with a massive infection of the chorio-allantois, embryos normally survived for at least 5 days. At 4 or 5 days the focal lesions are 1–2 mm. in diameter and superficially resemble those caused by vaccinia virus in this tissue (see figure). On further incubation isolated foci may attain a diameter of 3 mm. or more, and they then have a yellowish tinge. After the 5th day of incubation secondary lesions develop, which make it impossible to perform accurate counts. Histological section of the chorio-allantois at 4 or 5 days showed necrosis of the ectoderm over the centre of lesions, with proliferation at the periphery. The mesoderm was thickened, and there were numerous infiltrating cells immediately below the areas of affected ectoderm. Parasites were seen, in appropriately stained sections, both within and outside ectodermal and mesodermal cells. There was hypertrophy of the endoderm, but parasites were not found in this layer.

TECHNIQUE OF SERUM-NEUTRALISATION TESTS

The method is essentially the same as that used in virus-neutralisation tests by the pock-counting technique. Sera were inactivated at 57°C for 20 minutes. Suspensions of toxoplasma were obtained from chorio-allantoic membranes on which lesions had developed for 4 or 5 days. The membranes were ground in a mortar without abrasive and suspended in fluid consisting of 1 volume of broth and 9 of saline. The suspension was thoroughly shaken and allowed to settle for half an hour before removal of the supernatant fluid, which was then free from gross tissue particles. A smear of a known volume of the supernatant fluid was made on a slide and stained with methylene-blue. This allowed the number of parasites in the fluid to be estimated, and with practice it was possible to control roughly the number of lesions likely to develop after inoculation of the fluid. For the preparation of suspensions infected membranes were used 2 or 3 days after they were harvested. Membranes maintained for a fortnight or longer in nutrient broth at 4°C were still infective, though the number of lesions was less than that produced by membranes kept 2 or 3 days.



Toxoplasma lesions on chorio-allantois.

In neutralisation tests the inoculum consisted of 0·2 ml. of the inactivated serum to be tested, together with 0·2 ml. of the toxoplasma suspension. The mixture was allowed to stand at room temperature for half an hour and was then distributed on to the chorio-allantoic membranes of six eggs with a dropping pipette. The eggs were sealed and then gently rocked to distribute the inoculum over the available chorio-allantoic surface before incubation at 37°C for 4 or 5 days. In all tests control positive and negative sera were inoculated into eggs in the same way; as an additional control, eggs were inoculated with 0·2 ml. of toxoplasma suspension diluted with an equal volume of broth-saline (control inoculum). After 4 or 5 days' incubation chorio-allantoic membranes were removed and counts made of the focal lesions.

RESULTS

Table I shows the results with the four positive human sera and the immune rabbit serum together with "normal" serum controls. Each serum was tested on six eggs.

Table I shows that with the positive sera there is at least a sixfold reduction in the number of lesions compared with the control sera. The immune and "normal" rabbit sera were tested at a different time from the human sera, and the reduction with the immune rabbit serum is over 25 times. These findings would be considered significant in a virus-neutralisation test, but it cannot therefore be assumed that with a different type of infective agent the test is equally reliable. Proof of the reliability of the method would require the investigation of large numbers of sera and the application of statistical methods to the results. However, the findings with the serum-neutralisation test are in accordance with those of other methods used for diagnosis, and they also

TABLE I—SERUM-NEUTRALISATION TESTS ON CHORIO-ALLANTOIS

Serum	No. of lesions on chorio-allantoic membranes						Average no. of lesions
	1	2	3	4	5	6	
McC	10	7	16	9	6	14	10
SG 1	27	26	13	21	14	17	20
SG 2	30	14	35	26	21	19	24
SG 3	6	18	8	12	9	14	11
"Normal" human	181	142	154	160	124	—	152
Control inoculum	214	169	152	258	141	201	189
Immune rabbit	5	3	2	4	11	6	5
"Normal" rabbit	140	176	125	96	138	—	135

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parallel the results of complement-fixation tests described below. In addition to the sera noted in the table, 60 "normal" specimens were examined by the serum-neutralisation test in eggs. Of these, only 2 induced a significant reduction in the number of lesions on membranes. For these reasons there seems little doubt that the test can detect the presence of neutralising antibodies though the sensitivity of the method has yet to be assayed. Though undiluted sera were used for all tests, it was also shown that the positive rabbit serum still retained its neutralising potency in a dilution of 1/50, and one human serum tested was also effective at 1/15.

COMPLEMENT-FIXATION TESTS

Warren and Sabin (1942) investigated various types of toxoplasma antigens for complement-fixation and found great difficulty in obtaining an efficient preparation. Several types of infected mouse tissue were unsuitable for the preparation of antigen—a finding confirmed in this laboratory. The antigen they selected was made from infected rabbit brain, but they were not satisfied that their test was as reliable as the serum-neutralisation test on rabbit's skin. In the present work antigen was made from infected chorio-allantoic membranes, the method being similar to that described by Warren and Russ (1948). This antigen is simple to prepare and gives satisfactory results.

Technique.—Chorio-allantoic membranes heavily infected with toxoplasma were harvested after 5 days' incubation and ground in a mortar with powdered glass; 1·5 ml. of *M*/250 phosphate buffer of pH 7·4 was then added as diluent for each membrane. The whole was then frozen and thawed three times. The suspension was spun at low speed to remove glass and gross tissue particles, and the supernatant fluid was again spun at roughly 3000–4000 r.p.m. for 10 minutes. The clear supernatant fluid from this second spinning was used as antigen. At the same time a control antigen was made in exactly the same way from chorio-allantoic membranes which had not been infected with toxoplasma. Antigens prepared in this way may be anticomplementary in low dilution, but this has not interfered with the performance of actual tests. Preliminary titrations were carried out with known positive and negative sera to determine the optimal dilution of antigen which would give specific fixation with low-titred human sera. With positive sera antigen diluted up to 1/80 gave positive reactions, and for routine tests of human sera a dilution of 1/18 was used, since this gave maximal titres and was not anticomplementary. One batch of antigen was used for all tests described here.

A constant volume of 0·2 ml. was used for antigen, complement, and serum. Sera were first inactivated at 57°C for 20 minutes, and three minimal hæmolytic doses of complement were used in actual tests and two doses in control tubes. Fixation was allowed to take place at 4°C over night, as this method gave higher readings than fixation at room temperature or 37°C. Next day 0·4 ml. of sensitised cells (equal volumes of 5% sheep erythrocytes and hæmolysin diluted to contain 5 M.H.D.) was added to all tubes, which were then incubated at 37°C for half an hour. Control tubes included known positive and negative sera, antigen, and serum controls, and in addition the sera were tested in two dilutions with control antigen prepared from uninfected chorio-allantoic membranes. Representative results with the sera previously found to be positive for neutralising antibodies are shown in table II.

These results parallel those obtained with the serum-neutralisation test on eggs and are similar to the findings of Warren and Russ (1948) with six sera from patients with clinical evidence of toxoplasmosis.

In addition to the tests shown in table II 100 "normal" sera, including the 60 previously tested for neutralising antibodies, were also tested by complement-fixation. About a third of the sera gave a positive Wassermann reaction, and specimens from men, women, and children were included. It was found that 3 of the 100 "normal" sera could fix complement in dilutions of 1/20 or more. These three positive sera were tested by the neutralisation test in eggs, and two of the three were also positive by this method; the third specimen fixed complement in a dilution of 1/20 but was negative in eggs. These results probably indicate that the persons from whom the sera were obtained had had previous contact with toxoplasma. The sera were from women, one having a positive, and the others a negative, Wassermann reaction. In neither case, so far as is known, was there any history of previous infection or any symptom suggesting toxoplasmosis.

TABLE II—COMPLEMENT-FIXATION TESTS WITH TOXOPLASMA ANTISERA

Serum	Serum dilutions							Serum control 1/10	Antigen control	Control antigen +1/10 serum
	1/10	1/20	1/40	1/80	1/160	1/320	1/640			
McC ..	4	4	4	4	4	2	0	0	0	0
SG 1 ..	4	4	3	1	0	0	0	0	..	0
SG 2 ..	4	4	2	0	0	0	0	0	..	0
SG 3 ..	4	4	4	4	3	1	0	0	..	0
"Normal" human	0	0	0	0	0	0	0	0	..	0
Immune rabbit	4	4	4	4	4	4	1	0	..	0
"Normal" rabbit	0	0	0	0	0	0	0	0	..	0

4, complete fixation; 3, 2, 1, degrees of partial fixation; 0, no fixation.

DISCUSSION

Of the laboratory methods available for the diagnosis of toxoplasmosis recovery of the parasite from human tissues is diagnostic but rarely successful. Sabin (1942) recommends that a minimum of 6 mice and 2 guineapigs be inoculated; and, even if toxoplasma is present in suspected tissues, it may only produce an unapparent infection on first animal passage. Possibly the embryonated hen's egg could be used for primary isolation of the parasite from human tissues. The serum-neutralisation test on the skin of rabbits is said to be the most reliable method, but it is technically difficult and can only be carried out with fresh serum. Rabbits may vary in their susceptibility to infection with the parasite, and in the present work one of the few rabbits used showed no specific response after intradermal inoculation of a considerable dose of toxoplasma obtained from an infected mouse. Sabin and Feldman (1948) have described a new type of test, in which the staining of toxoplasma parasites with certain dyes is used to indicate whether or not a serum contains neutralising antibodies. When immune serum and toxoplasma are allowed to react and the parasites are then stained with alkaline methylene-blue, the protoplasm of extracellular parasites is unstained and the parasite has a crescentic shape, whereas with normal serum the cytoplasm is darkly stained and the parasites are rounded or oval. The appearances described by Sabin and Feldman as indicating an immune serum response are those seen in many of the familiar illustrations of the parasite and are usually found when films are made of extracellular parasites from a mouse 5 days after infection. With this dye test Sabin and Feldman have obtained very high titres in sera from cases of toxoplasmosis. The method appears to be technically simple but is based on a new principle which has yet to be proved.

Both methods described here are easy to perform, and neutralisation on the chorio-allantoic membrane of hens'

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eggs has obvious advantages over a test on the rabbit's skin. Antibodies do not develop in the embryonated hen's egg, and there are probably fewer variations with this type of host than with laboratory animals. In a laboratory where fertile eggs are available the determination of neutralising antibodies may be preferred as the serological method most likely to give a true estimate of the immune status of a patient. Complement-fixation, on the other hand, is a more familiar method and lends itself to epidemiological investigations as well as the diagnosis of individual cases. Antigen made from infected chorio-allantois is easy to prepare, and the test seems to present few technical difficulties. Both methods gave qualitatively similar results with 5 known positive sera and 60 "normal" sera; one "normal" serum gave a negative neutralisation test but positive complement-fixation in low dilution.

The finding of a small number of positively reacting sera among the "normal" specimens is perhaps not unexpected and presumably indicates symptomless infection. Mothers of infants with congenital toxoplasmosis must be carriers of the parasite and are unlikely to be the only persons infected. Apart from the congenital disease the modes of natural transmission of the infection are obscure, though immunologically similar strains of toxoplasma have been isolated from several domestic and laboratory animals (Sabin 1942). These animal reservoirs may be the source of the acquired infections in later childhood and in adults. In this country we still need to know whether toxoplasmosis is only another rare disease or whether it contributes significantly to the number of congenitally defective children.

SUMMARY

Two methods of demonstrating specific antibodies for toxoplasma in human serum are described: a neutralisation test on the chorio-allantoic membrane of the developing hen's egg and a complement-fixation test using infected chorio-allantois to prepare antigen.

Tests on 4 positive human sera, 1 immune rabbit serum, and over 60 "normal" sera indicate that the methods give reliable results.

I wish to thank Colonel H. E. Shortt, of the London School of Hygiene and Tropical Medicine, for the strain of toxoplasma; and Dr. Sven Gard, of the Statens Bakteriologiska Laboratorium, Stockholm, and Dr. H. G. Farquhar, of the Royal Liverpool Children's Hospital, who kindly supplied positive sera.

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"... The current budget estimates for England, Wales, and Scotland show a total charge for the health service of no less than £366m. ... If private expenditure on similar services is added, the nation's total bill for public and private medical care of all kinds must be of the order of £400m., about 4 per cent. of the national income, or £8 6s. a head of the population. There are no means of guessing whether the bill would have been much smaller had there been no health service, or of saying what the 'right' amount for the bill ought to be; but the total charge is heavy and, for three reasons, is likely to become heavier. ... It is conceivable that in the long run every pound spent on home nurses, midwives, general practitioners and health centres for the better equipment of the front-line medical team would be worth as much to the community as two pounds spent on the in-patient facilities of the hospitals. All these issues, however, are obscured by a fundamental lack of knowledge of medical economics, which stultifies much current criticism of the health service and probably also the Government's own understanding of where that service is going."—*Times*, May 31.

REPLACEMENT TRANSFUSION

TECHNIQUE IN THE NEWBORN

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THE first to use replacement transfusion and publish the method was Hart (1925), who described a case of icterus gravis neonatorum treated by withdrawal of blood from the longitudinal sinus while blood was transfused into the saphenous vein in an attempt to eliminate the circulating toxins. Although the baby did very well, this line of therapy does not seem to have been followed up, and was forgotten until the ætiology of the disease was more clearly understood twenty years later.

Diamond (1947), using fine 'Polythene' catheters (Farquhar and Lewis 1948), modified Hart's method, using the umbilical vein shortly after birth. Wallerstein (1947) adapted what was in principle the method of Hart by giving blood into a superficial arm vein and withdrawing from the anterior fontanelle, the volumes of blood being accurately measured in each case with a syringe. The use of the longitudinal sinus was not, however, universally popular, and he accordingly suggested making use of a superficial arm vein for withdrawal, the greatest flow being obtained by cutting it and allowing free hæmorrhage without a cannula. Indeed, only one vein was required, since blood could be given into the proximal end while the distal was allowed to bleed freely. In attempts to improve his technique he incorporated suggestions made to him by Vogel and Polayes. Vogel advocated the use of heparin to obviate clotting—an addition which Wallerstein (1946) condemned as dangerous. Polayes quickened the tempo of the whole operation by opening a small branch of the radial artery at the wrist and allowing it to bleed freely while blood was transfused through a superficial arm vein.

Arnold and Alford (1948) were interested in the infant which was not born in a maternity hospital and which might be admitted later in the newborn period after the umbilical cord had atrophied. After unsuccessful attempts at catheterising the inferior vena cava from an opening in the long saphenous vein in the mid-thigh they decided to make an incision in the inguinal region.

A point was marked on the skin 1·0–1·5 cm. perpendicularly distal to the inguinal ligament at its mid-point, and from it an incision was carried 2 cm. medially and parallel to the skin crease. The long saphenous vein was dissected out and received on an aneurysm needle; an ether compress was applied for a moment to prevent retraction of the vein, which was then cut; the polythene tube was introduced and, with a slight rotary action, worked up for 2–4 in. until it lay within the common iliac vein or the inferior vena cava. Blood was then withdrawn and infused alternately in volumes of 20 ml. at each stroke until a total of some 500 ml. had been transfused, with, it was believed, the resultant exchange of 80–85% of the original blood. Clotting in the syringe and plastic catheter was prevented by flushing through with heparin solution 10 mg. in 150 ml. of saline solution, but none was allowed to enter the infant's circulation lest it should precipitate hæmorrhagic disease. After the transfusion, up to 10 ml. of 5% calcium gluconate was given to overcome the effects of the citrate contained in the donated blood, and intensive chemotherapy with sulphonamides and penicillin was given for several days.

Wiener and Wexler (1946) calculated that, by transfusing a volume of blood equal to the baby's calculated blood volume, a 65% exchange was effected, and that 500 ml. of blood would lead to the exchange of about 87%. Wiener et al. (1948), however, believed that the remaining 13% of the original blood was a potential danger owing to the associated antibody and the risk of intravascular clumping, and they further believed that they could

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obtain superior results by transfusing 1000 ml. of blood, with the resultant exchange of about 98%. In their opinion Diamond's method was tiring to the operators and the various three-way connexions exposed the baby to a very real danger of air embolism. Accordingly they decided to use the radial artery and a superficial arm vein.

The baby was heparinised during the procedure by 2–4 equally spaced injections of heparin (200 units), the first being given 15 min. before the artery was opened and the last midway through the operation. Wiener et al. (1947) did not believe that heparin, in the dose recommended, increased the risk of hæmorrhage in the newborn.

While waiting for the first injection of heparin to take effect, they dissected out a superficial arm vein and introduced the giving set in readiness. After 15 min. the radial artery was exposed at the wrist and arteriotomy was done by passing a fine scalpel through the centre and incising obliquely to the side of the vessel, transfusion being begun at the same moment, and the operation continued until 1000 ml. had been exchanged. During the exchange 20 ml. of 10% calcium gluconate was given in four equally spaced divided doses, and at the end the radial artery was ligated—an adequate collateral circulation being present around the wrist.

The babies were reported as tolerating the procedure very well, but it was admitted that a higher degree of technical skill was required.

Mollison et al. (1948) and Mollison and Cutbush (1948) have also published a technique of exchange transfusion via the umbilical vein based on Diamond's (1947) description.

Pinkus (1948) reported a method of using the umbilical vein when the cord had atrophied:

An incision was made transversely in the skin of the anterior abdominal wall 1 cm. cephalad to the upper margin of the insertion of the umbilical cord, the umbilical vein being clearly visible deep to the thin midline aponeurosis, which was divided, and the vein was elevated from the underlying transversalis fascia and peritoneum. The vein was next opened and very easily catheterised with polythene tubing, even several days after birth.

Pinkus claimed that this method was simple, safe, and that no high degree of technical skill was required.

The simplicity of the umbilical route at birth cannot be denied and, should Rh incompatibility be diagnosed antenatally and the apparatus prepared while labour is in progress, an attempt should always be made to utilise the umbilical vein if replacement transfusion is deemed necessary. However, difficulties in using this method are sometimes encountered. Thus much time may be wasted by arrest of the catheter, especially at the anterior abdominal wall, and some attempts eventually have to be abandoned. It is in such cases that the approach suggested by Arnold and Alford (1948) is so simple and effective, especially if the precaution is taken to have a little warm saline solution syringed through the catheter as it is being passed.

If one uses these two routes, both safe and relatively simple, it seems unnecessary to embark on radial arteriotomy, long-continued aspiration of the longitudinal sinus, or an abdominal incision to within paper thickness of the peritoneal cavity in a newborn baby. We have checked this latter approach by dissections on stillborn infants, and, though agreeing that catheterisation is extremely easy and the whole procedure simple, we have taken a dislike to seeing the abdominal viscera through the very thin transversalis fascia and peritoneum when we have exposed the vein. Infection menaces the newborn, and this approach seems to be an unnecessary risk even under the best hospital conditions, apart from the distaste that might be expressed later by the owner at an unpleasing cosmetic result. If, however, this route is used, we suggest that a crescentic incision round and nearer to the umbilicus might obviate unsightly scarring.

The apparatus described by Diamond (1947), unless specially constructed, tends to be cumbersome; and, if others in this country suffer nowadays as we do from poorly fitting adapters, the presence of air-leaks in the apparatus is most troublesome.

Heparin has been the subject of much dispute and, we feel, unnecessarily so, since so little is needed that it must be innocuous, the apparatus running for a long time without requiring rinsing.

IN-VITRO EXPERIMENT

The volume of blood to be exchanged in any given case we have demonstrated by an in-vitro experiment for undergraduate instruction:

A quantity of $N/10$ hydrochloric acid equal to the baby's expected blood volume was placed in a large flask with a few drops of universal indicator, the resultant colour being red. The plastic catheter was immersed in this solution and connected to the transfusion apparatus, the replacement next being made with $N/100$ NaOH buffered with boric acid so adjusted as to give green at 90% and blue at 95% exchange.

Controls were set up in a series of test-tubes, and the transfusion was given, careful note being made of the volume required to achieve the various replacement percentages.

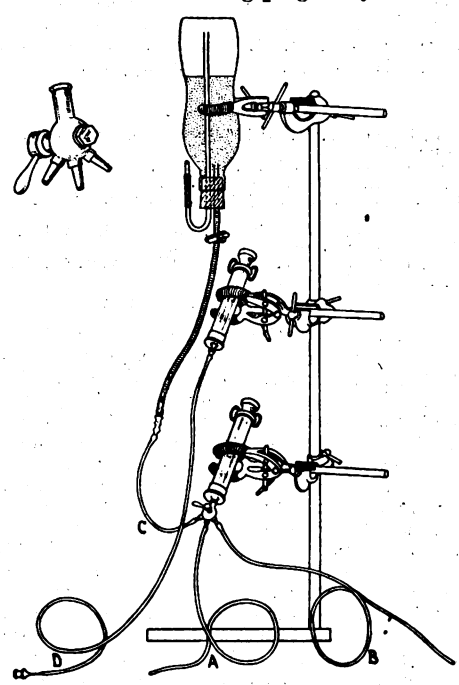
From these findings we have drawn up the following figures:

Baby's calculated blood volume (ml.)	*Blood transfused to achieve 95% exchange (ml.)*
200	650
300	880
400	1080

It should also be remembered that the blood given is by no means comparable in hæmoglobin content to that removed, for the donor's level is not necessarily 100% and it has been further diluted with citrate. In south-eastern Scotland citrate is added in the proportion of 1 part in 10. The mean hæmoglobin of seventy consecutive donors in this same area was 92% (Haldane), the scatter ranging from 82 to 106% of normal. After the blood has been diluted with citrate the average figure becomes about 83% (Haldane).

PROCEDURE

If it is decided during pregnancy that the fœtus might derive benefit from replacement transfusion, preparations are made before the onset of labour.



The apparatus: A, tube through which suction is applied to withdraw blood; B, tube to waste; C, tube delivering donor's blood; D, tube from syringe containing heparin.

The apparatus (see figure), including the heavy metal retort stand and clamps, is dismantled and autoclaved (except the polythene catheters), and two pædiatric residents, with a member of the blood-transfusion service (B.T.S.), are

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in attendance during the second stage of labour. Blood is taken from the baby at birth, and the B.T.S. technician does a direct Coombs test in the side-room, while one resident carefully examines the blood picture and the other, having examined the baby, assembles the apparatus in a nursery for premature babies. Within half an hour the results have been obtained and discussed and a decision reached whether or not to interfere.

The baby is transferred to the nursery, where the temperature and humidity allow him to be freely exposed. A length of Kramer wire splint is then bent to form a V; and, after it has been padded, the apex is placed beneath the sacrum, and the legs are splinted in abduction and external rotation to the limbs of the splint.

The B.T.S. technician returns with carefully cross-matched Rh-negative blood, and the operation proceeds. The baby is best dealt with in a basket or papier-mâché basinette placed on a table, the assembled apparatus standing alongside. The umbilical cord is isolated with sterile towels, a ligature is passed through and tied loosely round it at its base, and the cord is next cut through about $^1/_2$ in. from the abdominal wall. With fine mosquito forceps the umbilical vein is held open by the assistant while the operator passes the catheter and ensures that blood can be easily aspirated. Should this method fail, the inguinal approach is immediately available and the inferior vena cava catheterised from the long saphenous vein.

The apparatus is exceedingly simple, thanks to the efficient four-way connexion, the well-fitting all-glass syringes, and the solid retort stand.

We withdraw only 10 ml. at a time through tube A and pass it to the waste receiver through tube B together with any air-bubbles which may have entered from the originally empty A. The syringe is at once filled with 10 ml. of donor's blood from the bottle through tube C and injected into the baby. The withdrawal of only 10 ml. each time, and the immediate filling of the syringe with citrated blood when it becomes empty, make clotting most unlikely, and it is only occasionally that the working syringe is washed out via catheter D with heparin from the other syringe, which stands full of this solution.

Suction should be moderate and steady and, should the flow be temporarily arrested during aspiration, a slight manipulation of the catheter will generally restart a smooth flow. In no way could the operation be called tiring, and it is sufficiently interesting to prevent its becoming tedious.

A nurse keeps a careful record of the volumes withdrawn and transfused and, when the desired exchange has been completed, an additional bonus is given to compensate for the lower hæmoglobin percentage of the donated blood. 5 ml. of 10% calcium gluconate is next given and an injection of water-soluble vitamin-K analogue. Chemotherapy is begun immediately.

Should any anxiety be felt about a minute amount of heparin escaping into the baby's circulation, a simple precaution is to have an ampoule of protamine sulphate standing by.

SUMMARY

The various methods of replacement transfusion in the newborn are summarised and that used in Edinburgh is described in detail. An in-vitro method of calculating the volumes requiring to be exchanged is also described. Reference is made to the possible need to compensate for an abnormally low hæmoglobin content of donated blood.

We thank Prof. R. W. B. Ellis for his encouragement throughout the investigation; Dr. R. A. Cummings and Mr. A. Crosby, of the South-East Scotland B.T.S., for invaluable assistance; Mr. C. Shepley, University artist, for the diagram of our apparatus; and the nurses of the labour ward of the Simpson Memorial Maternity Pavilion for their cheerful coöperation.

References at foot of next column

SENSITISATION OF PENICILLIN-RESISTANT PATHOGENS

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THE apparent transference of sensitivity from one organism to another has been noted by several workers. Voureka (1948) reported as a new phenomenon the reversal of resistance, some strains of resistant organisms becoming sensitive when grown in the presence of other kinds of organisms (either penicillin-sensitive or penicillin-resistant) or their metabolic products. Winner (1948) quantitatively sensitised a penicillin-resistant staphylococcus by this method.

We have previously reported that the differences in susceptibility of certain pathogens to penicillin are associated with differences in their metabolic reactions as well as with the presence or absence of certain catalytic systems. In this connexion we have found (George and Pandalai 1948) that magnesium ions can render certain gram-negative penicillin-resistant pathogens, such as *Bact. coli*, sensitive to penicillin. It is thus clear that

TABLE I—EFFECT ON *Bact. coli* OF GROWING WITH *Staph. aureus*

Bact. coli	Concentration of penicillin (units per ml.)						
	0·5	1·0	2·0	4·0	6·0	8·0	10·0
Untreated ..	+	+	+	+	+	+	−
Treated ..	+	−	−	−	−	−	−

+, growth; −, inhibition.

sensitivity to penicillin depends essentially on a chemical or metabolic factor, and that bacteria short of or lacking this factor could, when provided with it from without, become more sensitive to penicillin.

To confirm this we have grown penicillin-sensitive and penicillin-resistant organisms together, isolated them, and ascertained the least amount of penicillin needed to inhibit growth of the strains so isolated. We report the results of our experiments here.

TABLE II—EFFECT ON *Staph. aureus* OF GROWING WITH *Bact. coli*

Staph. aurcus	Concentration of penicillin (units per ml.)				
	0·01	0·03	0·05	0·1	0·2
Untreated	+	+	+	+	−
Treated	+	−	−	−	−

+, growth; −, inhibition.

EXPERIMENT I

This experiment consisted in inoculating together a loopful each of a sixteen-hour broth culture of penicillin-resistant *Bact. coli* and penicillin-sensitive *Staph. aureus* in nutrient broth and incubating the mixed culture over night at 37°C. Next day smear plates on nutrient agar

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TABLE III—EFFECT ON *S. typhi* OF GROWING WITH *Staph. aureus*

S. typhi	Concentration of penicillin (units per ml.)					
	3·0	4·0	6·0	8·0	10·0	12·0
Untreated ..	+	+	+	+	+	−
Treated ..	+	+	−	−	−	−

+, growth; −, inhibition.

TABLE IV—EFFECT ON *Staph. aureus* OF GROWING WITH *S. typhi*

Staph. aureus	Concentration of penicillin (units per ml.)				
	0·01	0·03	0·05	0·1	0·2
Untreated ..	+	+	+	+	−
Treated	+	+	−	−	−

+, growth; −, inhibition.

were made and incubated over night. Individual colonies of the two strains were next picked out and inoculated into nutrient broth and incubated over night. These cultures were used to determine by serial dilutions the least amount of penicillin needed to inhibit their growth. Controls were provided by subculturing the original penicillin-sensitive and penicillin-resistant organisms in nutrient broth. The results are given in tables I and II.

Table I shows that the least amount of penicillin needed to inhibit growth, which was 10 units per ml. for the original strain of *Bact. coli* fell to 1 unit per ml. for the strain grown with *Staph. aureus*.

Table II shows the remarkable fact that the *Staph. aureus* also became more penicillin-sensitive after being grown with *Bact. coli*. This result suggests that there are several yet unknown factors bringing about changes in the pathogens when they are grown together.

EXPERIMENT II

The results of growing *Salmonella typhi* and *Staph. aureus* together (tables III and IV), show that not only was *S. typhi* rendered penicillin-sensitive by growing with *Staph. aureus* but also *Staph. aureus* was rendered more penicillin-sensitive by growing with *S. typhi*.

TABLE V—EFFECT ON DYSENTERY BACILLI OF GROWING WITH *Staph. aureus*

Dysentery bacilli	Concentration of penicillin (units per ml.)						
	2·0	4·0	6·0	8·0	10·0	12·0	14·0
Untreated ..	+	+	+	+	−	−	−
Treated ..	+	+	+	+	+	+	−

+, growth; −, inhibition.

EXPERIMENT III

When dysentery bacilli (Shiga) were grown in the presence of *Staph. aureus*, exactly as described above, no effect was observed, neither of the organisms becoming more sensitive to penicillin. On the contrary, the dysentery organisms became even more penicillin-resistant when grown with *Staph. aureus* (table V).

EXPERIMENT IV

We also studied the effects of the temperature of incubation and of the length of time during which the organisms were grown together, and the durability of the acquired sensitivity. For this purpose the period of contact and the temperature of incubation were varied and the sensitivity to penicillin was tested at different intervals. Tables VI and VII give the results of these experiments.

The results indicate that in the case of *Staph. aureus* the longer the contact the greater the sensitivity to penicillin. The greatest sensitivity was attained at a temperature of 37°C. In the case of *Bact. coli* half an hour's association at any temperature up to 37°C with *Staph. aureus* produced the greatest sensitivity; the least amount of penicillin needed to inhibit growth fell from 10 units to 1 unit per ml. In general the sensitivity to penicillin acquired by the previously resistant organisms lasted a long time.

EXPERIMENT V

To discover the factor responsible for inducing sensitivity, we fractionated an extract of penicillin-sensitive organisms and used these fractions separately to induce sensitivity in other organisms. Results of a few typical tests are given in tables VIII–X. The methods of Thompson and Dubos (1938) and Sevag et al. (1938) were used for obtaining the different fractions.

These fractions were tested to ascertain their nature. Fraction A gave strongly positive biuret and Sakaguchi reactions and, after boiling with hydrochloric acid for 2 or 3 minutes, a positive Bial's test for pentoses, and it reduced Benedict's solution. These properties strongly

TABLE VI—EFFECT OF TEMPERATURE AT WHICH *Bact. coli* AND *Staph. aureus* WERE GROWN TOGETHER

Organisms	Temperature	Concentration of penicillin (units per ml.)										
		Treated organisms						Controls				
		0·5	1·0	2·0	4·0	6·0	8·0	2·4	4·0	6·0	8·0	10·0
Bact. coli	Refrigerator	+	−	−	−	−	−	+	+	+	+	−
	Room (28°C)	+	−	−	−	−	−	+	+	+	+	−
	37°C	+	−	−	−	−	−	+	+	+	+	−
		0·01	0·03	0·05	0·1	0·2		0·01	0·03	0·05	0·1	0·2
Staph. aureus	Refrigerator	+	+	+	−	−		+	+	+	+	−
	Room (28°C)	+	+	+	−	−		+	+	+	+	−
	37°C	+	−	−	−	−		+	+	+	+	−

+, growth; −, inhibition.

suggest that fraction A, or at any rate the greater part of it, consisted of a nucleoprotein.

Fraction B and fraction A2 were shown, by the phloroglucin colour-reaction, to be ribonucleic acid.

The remaining fraction, A1, from nucleoprotein was taken to be the protein moiety.

1 ml. of 1/250 of each fraction was incorporated into 10 ml. of melted and cooled nutrient agar and plated. Then 1 loopful of an 18-hour culture of *Bact. coli* was spread on each plate and incubated at 37°C. The colonies were isolated after 16 hours and subcultured into 5 ml. of fresh nutrient broth. The least amounts of penicillin needed to inhibit the growth of these treated cultures were ascertained. The results are given in tables VIII–X.

There is ample indication that the entire sensitising factor is in the ribonucleic-acid fraction, for the protein

TABLE VII—EFFECT OF LENGTH OF ASSOCIATION BETWEEN *Bact. coli* AND *Staph. aureus*

Organisms	Length of contact	Concentration of penicillin (units per ml.)										
		Treated organisms						Controls				
		0·5	1·0	2·0	4·0	6·0	8·0	2·0	4·0	6·0	8·0	10·0
Bact. coli	½ hour	+	−	−	−	−	−	+	+	+	+	−
	2 hours	+	−	−	−	−	−	+	+	+	+	−
	5 hours	+	−	−	−	−	−	+	+	+	+	−
		0·01	0·03	0·05	0·1	0·2		0·01	0·03	0·05	0·1	0·2
Staph. aureus	½ hour	+	+	+	+	−		+	+	+	+	−
	2 hours	+	+	+	+	−		+	+	+	+	−
	5 hours	+	−	−	−	−		+	+	+	+	−

+, growth; −, inhibition.

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TABLE VIII—EFFECT ON *Bact. coli* OF GROWING WITH FRACTION A (NUCLEOPROTEIN)

Strain of *Bact. coli*	Concentration of penicillin (units per ml.)						
	0·5	1·0	2·0	4·0	6·0	8·0	10·0
Untreated ..	+	+	+	+	+	+	−
Treated ..	+	−	−	−	−	−	−

+, growth; −, inhibition.

TABLE IX—EFFECT ON *Bact. coli* OF GROWING WITH FRACTION B (RIBONUCLEIC ACID)

Untreated ..	+	+	+	+	+	+	−
Treated ..	+	−	−	−	−	−	−

+, growth; −, inhibition.

TABLE X—EFFECT ON *Bact. coli* OF GROWING WITH FRACTION A1 AND A2 (RIBONUCLEIC ACID AND PROTEIN RESPECTIVELY OF NUCLEOPROTEIN FROM *Staph. aureus*)

Untreated ..	+	+	+	+	+	+	−
Treated with fraction A1	+	−	−	−	−	−	−
Treated with fraction A2	+	+	+	+	+	+	−

+, growth; −, inhibition.

moiety of the nucleoprotein induced little or no sensitivity.

DISCUSSION

The results presented above show that the association of penicillin-sensitive with penicillin-resistant pathogens causes, in some unknown way, the penicillin-resistant ones to become penicillin-sensitive. Adaptive changes in the metabolic processes of organisms are now well known (Kelly et al. 1947), and numerous instances are on record of how organisms in foreign environments adapt themselves by suitable changes in their biological activities and get acclimatised to changed environments. It follows that a particular set of pathogens which are penicillin-resistant—e.g., *S. typhi*, *Bact. coli*, and dysentery bacilli—may under the influence of penicillin-sensitive organisms—e.g., pneumococci, *Corynebacterium diphtheriæ*, streptococci, and staphylococci—be rendered sensitive to penicillin.

In our experiments the ribonucleic-acid moiety isolated from the bacterial cells was mainly responsible for imparting sensitivity to the penicillin-resistant pathogens. It is well known that the relative amounts of nucleic acids in some gram-positive organisms differ from those in some gram-negative organisms, the ratio of ribonucleic acid to desoxy-ribonucleic acid being greater in the penicillin-sensitive organisms and smaller in the penicillin-resistant ones (Henry et al. 1945).

Penicillin seems to react with the ribonucleic-acid moiety of the bacterial cell to inhibit the growth of the cell. When nucleic acid is added externally along with the penicillin, the latter either reacts with the external nucleic acid, leaving the cell nucleic acid to function unimpaired and growth to continue, or, even if penicillin reacts with cell nucleic acid, the added nucleic acid makes up for the loss, allowing growth to continue (Pandalai and George 1947). Thus, when penicillin-resistant organisms are grown in the presence of nucleic acid extracted from penicillin-sensitive organisms, the nucleic acid becomes part and parcel of the cellular material of the penicillin-resistant organisms and renders them penicillin-sensitive. These facts explain the anti-penicillin action of added ribonucleic acid, and emphasise the importance of the presence or absence of nucleic acids and their products in blood and other body fluids as a determining factor in penicillin therapy.

The results suggest the possibility of reversing the acquired or natural resistance to drugs at will. The mechanism of the reversal of resistance is not clear, but it is reasonable to believe that bacterial adaptation to a fresh environment develops in the presence of other organisms.

Very probably the effect in the case of *Staph. aureus* and *Bact. coli* is tied up inter alia with the formation of cocarboxylase and consequent facilities for phosphorylation in the final breakdown of pyruvic acid. The magnesium ions play a very important part in this reaction. It may also be pointed out that the transference of sensitivity to penicillin from one organism to another by such a simple process as mere contact suggests that the sensitivity depends on a highly labile constituent of the bacterial cell. This is in accord with our earlier observations as well as that of Voureka (1948).

SUMMARY

The growing of penicillin-sensitive and penicillin-resistant organisms together may cause the penicillin-resistant organisms to become penicillin-sensitive.

Growth together for half an hour at 37°C is in some cases sufficient to induce such sensitivity.

The acquired sensitivity lasts a fairly long time.

Our earlier postulate that complex catalytic systems are present in pathogens and responsible for either sensitivity or resistance to penicillin is supported by the results of experiments reported here.

The factor responsible for the sensitivity to penicillin is a very labile constituent of the bacterial cell, and appears to be ribonucleic acid.

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ANURIA FOLLOWING ISCHÆMIA OF THE RENAL CORTEX

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Trueta et al. (1947), in their studies of the renal circulation in animals, detected the existence of a subcortical vascular shunt, by which the blood-stream is diverted from the cortex to the medulla through the vasa recta which emerge from glomeruli situated in the deepest zone of the cortex. These workers attribute an important rôle to this change of the circulation in the causation of some renal diseases in man, such as bilateral cortical necrosis and some forms of anuria.

Following recent clinical observations, some workers have suggested that in the background of healed oliguric/anuric conditions a "medullary" circulation was present—e.g., Humphrey and Jones (1948) in post-abortion oliguria, Williams (1947) in icterus infectiosus, and Scott and Rob (1947) in traumatic uræmia. The treatment with spinal anæsthesia or splanchnic block was based on this assumption and was thought to be responsible for the successful termination of the condition. Nevertheless Black et al. (1948), investigating the renal hæmodynamics of patients with nephritis, and Sanderson (1948), dealing with renal disease following abdominal trauma, doubted the importance of the "medullary" circulation in renal disease in man.

I therefore report here a case in which a clearly demonstrable ischæmia of the renal cortex was responsible for the anuria of a woman with eclampsia.

A pregnant woman, aged 34, was admitted to the Szombathely Hospital on Oct. 17, 1947. No pathological change was found in her urine three weeks before her delivery.

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On examination the blood-pressure was 210/100 mm. Hg, pulse-rate 80 per min., and temperature 97·6°F. Albumin and some blood were found in the urine.

On Oct. 18 an eclamptic attack occurred during labour and was followed by a short coma. After half an hour, and during a second attack, a healthy female baby was born. Half an hour later the patient had a third attack, followed by a period of unconsciousness lasting for 6–8 min., after which she remained somnolent. About 250 ml. of coffee-like urine was passed on the first day after delivery. On Oct. 19 the urine decreased to 150 ml., on the 20th to 100 ml., and on the 21st to 80 ml.

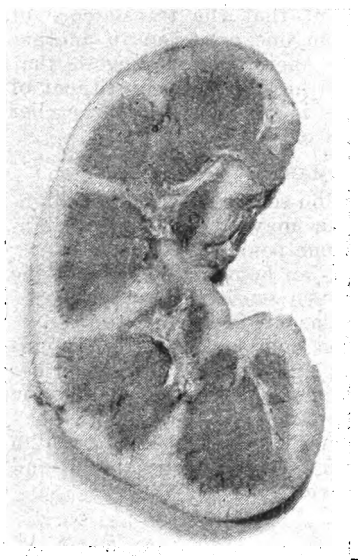

Fig. 1—Section of kidney showing complete ischæmia of cortex and congestion of medulla.

On Oct. 22 no urine was passed for twelve hours. The patient had continuous spasms and mild tenderness of the lumborenal region. Temperature over 100·2°F, pulse-rate 120 per min., blood-pressure 175/90 mm. Hg. Urine: sp. gr. 1·025; acid; albumin +++, pus ++. The sediment was full of polymorphs; no casts or erythrocytes were found. Cystoscopy showed a few drops of grey turbid urine in the bladder. The ureteric orifices seemed to be mildly swollen. No urine was coming from either of them or from the catheters, which were passed quite smoothly up the ureters. Red-cell count: 1,600,000 per c.mm., Hb 33%, and white cells 32,000 per c.mm. Non-protein nitrogen 185 mg. per 100 ml.

Treatment consisted in blood-transfusions, dextrose, paravertebral injections of procaine to both splanchnic regions, and saline infusions.

Course.—Despite all these measures the daily output of urine did not increase, and the patient died on Oct. 24.

Clinical Diagnosis.—Eclampsia with anuria and uræmia (symmetrical cortical necrosis ?).

Necropsy Findings.—The uterus was as large as two fists, with blood-clots in its cavity, and free parametrium. Typical eclamptic changes were found in the liver. Lungs and liver smelt of urine. The brain on section was moist; the hypophysis was large owing to the pregnancy. Both kidneys were much swollen and each weighed 200 g.; on palpation they seemed harder than normal. On section the highly anæmic and slightly broadened cortex differed strikingly and sharply from the hyperæmic pyramids of the medulla. The hyperæmia of the pyramids was most remarkable in view of the general anæmia everywhere else (fig. 1). Macroscopically the condition was renal cortical ischæmia with congested medulla, pronounced general anæmia, and pulmonary and cerebral œdema.

Histology.—Hæmorrhages and patchy necrosis were found in the liver, partly in a state of reabsorption; fatty degeneration was also present. The hypophysis was enlarged owing to pregnancy. The extreme anæmia of the cortex and great hyperæmia of the medulla of the kidneys were clearly demonstrable by a benzidine reaction. Fig. 2 shows that the glomeruli and the intertubular capillary network of the cortex were completely empty of blood. The vasa recta, on the other hand, were highly hyperæmic. A remarkable point was that, despite the complete ischæmia of the cortex, its tubular system showed no sign of degenerative changes, the delicate structure of the tubules having been preserved with its basal striations and brush border. The endothelial cells of the glomeruli as well as the basal membrane were mildly swollen, but there was no sign of increase in the number of cells.

DISCUSSION

We may infer that the cause of the anuria was the extreme diversion of the blood within the kidney. The redistribution of the renal blood from the cortex towards the medulla led to complete cortical ischæmia and to a great decrease of pressure in the cortical glomeruli. This change certainly favoured the stoppage of the glomerular filtration and the development of a filtration anuria, as postulated by Trueta (1948) and Gömöri (1948). In the development of this type of anuria there may be a still further factor in the increased reabsorption from the Henle tubules, the latter being wedged between the congested vasa recta (Trueta et al. 1947).

Why did not the cortex become necrotic in view of its complete ischæmia? A possible explanation may be that at the beginning cortical ischæmia was incomplete and the blood-flow was still adequate for the nutrition of the cortex; but, when the shunt came into operation, the glomerular blood-pressure fell below the filtration-pressure level, which was the cause of death. Therefore complete cortical ischæmia seems to have developed only a short while before death. A more lasting cortical ischæmia would have led to bilateral cortical necrosis or, in less severe conditions, to evident damage to the tubular cells.

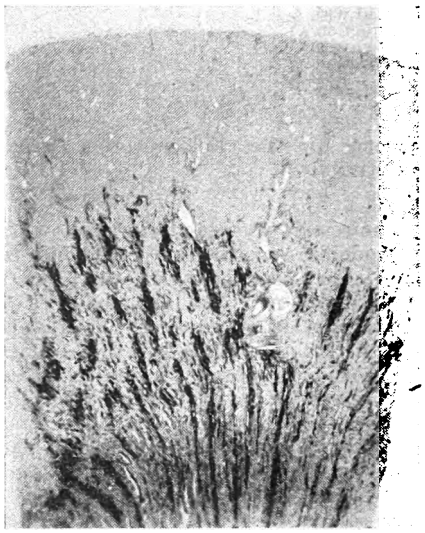

Fig. 2—Section of kidney showing benzidine reaction: glomeruli and intertubular capillary network of renal cortex completely ischæmic; and vasa recta, deriving from efferent vessels of juxtamedullary glomeruli, highly hyperæmic.

The ætiology of the symmetrical cortical necrosis was thought to be either thrombosis or spasm of unknown origin (Furtwaengler 1927, Penner and Bernheim 1940). Trueta et al. (1947) were the first to suggest that the redistribution of the renal blood-flow may be responsible for the development of symmetrical cortical necrosis. The present case firmly supports their view. In the cases of advanced cortical necrosis so far described there is no possibility of inferring the previous condition of the renal circulation, because of the extent of the necrosis and of the secondary changes in the vessel walls and of the thrombosis. The present case establishes, with reasonable certainty, that the renal shunt described by Trueta et al. may be responsible for anuria and uræmia in man.

SUMMARY

Necropsy on a woman who died after eclampsia and anuria lasting seven days showed complete ischæmia of the renal cortex and extreme hyperæmia of the medulla. The anuria seems to have been due to diversion of blood from the cortex to the medulla.

In spite of complete cortical ischæmia there were no signs of cortical necrosis.

The complete diversion of the blood-flow from the cortex to the medulla was identical with what Trueta et al. (1947) found in animal experiments. It may therefore be assumed that the same mechanism of blood diversion exists in the human kidney.

The extreme operation of such blood diversion may be considered to cause anuria and, in cases in which it operates for long, symmetrical cortical necrosis.

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No such form of blood diversion found at necropsy has previously been published.

I wish to thank Dr. G. Romhanyi for his kind help and encouragement.

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THYROTOXICOSIS WITH OPHTHALMOPLEGIA, MYOPATHY, WOLFF-PARKINSON-WHITE SYNDROME, AND PERICARDIAL FRICTION

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THE following case is reported because it is believed to be unique in simultaneously showing four unusual complications of thyrotoxicosis, two of which responded to treatment of the primary condition.

CASE-REPORT

A Czechoslovak widow, aged 40, was admitted to the West London Hospital in February, 1948, under the care of Dr. L. P. E. Laurent.

Previous History.—In 1935 she was treated for thyrotoxicosis in Czechoslovakia; her basal metabolic rate (B.M.R.) was reported as +67%. She remained well until November, 1939, when she noticed weakness, palpitations, tremor of the hands, enlargement of her goitre, and prominence of her eyes. She was seen at a hospital in the U.K. in December, 1939, and was given a course of deep X-ray therapy to the thyroid, with no clinical improvement. A further course of deep X-ray therapy was given, and subsequently Lugol's iodine minims 3 b.d. In July, 1941, she was given thyroid sicc. gr. ½ twice daily for hypothyroidism. When seen in June, 1945, she required no treatment. Her pulse-rate was 78 per min., pulse regular, and thyroid not palpable.

In February, 1947, she first attended the outpatient department of the West London Hospital because of hoarseness for the previous eight months. Her larynx contained mucopus. Radiography of her sinuses and chest were normal. In July, 1947, she complained of difficulty in eating and drinking, because this produced bouts of coughing. A barium swallow showed free flow throughout the œsophagus. She was advised to come into hospital for endoscopy, but she declined.

In September, 1947, she developed proptosis of the right eye and paresis of the right internal rectus muscle. She then complained of intermittent diplopia since May, 1947. Her condition steadily deteriorated, and in February, 1948, she was admitted to hospital.

On admission, besides the prominence of her right eye, diplopia, hoarseness, and occasional dysphagia, she complained of undue tiredness, nervousness, palpitations, and a cough when she attempted to eat or drink. She had noted no dyspnœa, her menstruation was regular, and she had not lost weight.

She looked well nourished, pale, and rather apprehensive. Her voice was hoarse. Her facies, apart from the striking eye signs, was expressionless. There was well-marked lid retraction of the right eye, with severe exophthalmos, chemosis, and almost complete external ophthalmoplegia, especially for horizontal movements; the ocular axis was depressed and abducted. There was slight lid-retraction of the left eye, but it could be closed. The pupils and optic fundi were normal.

The thyroid was seen to be moderately enlarged; it was smooth, but unusually firm in texture. No bruit was heard over the gland. The pulse was regular, pulse-rate 100. There was no clinical cardiac enlargement, but a loud systolic "creaking," especially on full expiration and unaffected by changes of posture, was heard over the whole precordium, maximally in the second left intercostal space, about ½ in. lateral to the left border of the sternum. Her blood-pressure was 120/70 mm.Hg.

The abdomen showed no abnormality. Examination of the nervous system showed, besides the ophthalmoplegia, much weakness and some wasting of both sternomastoid muscles. When she was lying flat and was asked to raise her head she tried to jerk it up or lifted it with her hand; she could not keep her head off the pillow without assistance. Asked to sit up, she jerked her body forward and her neck hyperextended, but in the sitting position she could maintain a normal posture of her head.

Laryngoscopy showed paresis of the left vocal cord, which at rest lay partially abducted. The right cord was fully mobile.

Investigations.—B.M.R. 40%; blood-cholesterol 90 mg. per 100 ml.; Hb (Haldane) 80%; red cells 4,960,000 per c.mm.; white cells 9800 per c.mm. (polymorphs 53%, eosinophils 2%, monocytes 8%, lymphocytes 37%); erythrocyte-sedimentation rate 14 mm. in first hour (Westergren); Wassermann and Kahn reactions negative; blood-creatinine 1·35 mg. per 100 ml.

An electrocardiogram (fig. 1) showed regular rhythm at 100 per min., a P–R interval of 0·08 sec., Q R S interval 0·12 sec., inversion of T waves and depression of ST segments in leads I, II, III, and CR 7, this being typical of the Wolff-Parkinson-White syndrome (Wolff et al. 1930).

Radiography of the skull was normal, and of the chest showed calcified hilar glands but no evidence of retrosternal goitre. Radiologically the size of the heart was just within normal limits (cardiothoracic ratio 0·5 : 1), but the postero-anterior view showed a prominent pulmonary conus. The heart was vertical.

A 24-hour specimen of urine showed well-marked creatinuria, containing creatin 0·5 g. and creatinine 1·2 g.; otherwise it was normal.

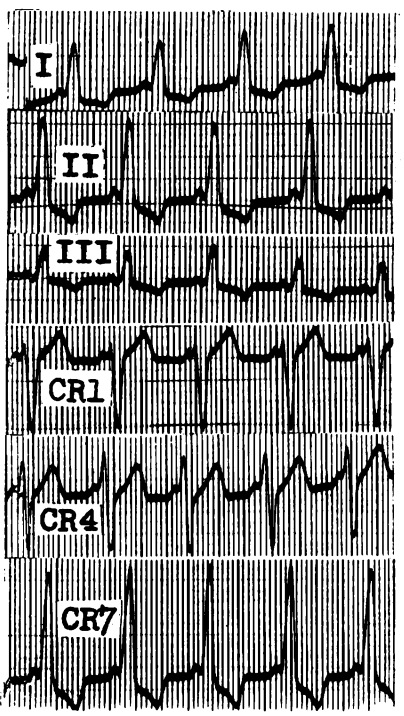

Fig. 1—Wolff-Parkinson-White syndrome on [admission.]

Progress.—Four days after admission the patient began a course of methyl thiouracil 0·2 g. t.i.d., and by the twelfth day after admission her pulse was regular, pulse-rate 80 per min. She was seen in consultation by Mr. Harvey Jackson, who advised and carried out orbital decompression and tarsorrhaphy for her right exophthalmos on the thirteenth day. By the end of the third week after admission she said she felt much better, and her apprehension had largely disappeared. The precordial friction sound was much diminished and was heard maximally as before. A further electrocardiogram (fig. 2) showed reversion to a normal P–R interval of 0·16 sec. and Q R S duration 0·08 sec. The T waves were upright in all leads, and RT depression had disappeared. Though palpitations were complained of at intervals, paroxysmal tachycardia was never found.

In view of the persistence of evidence of muscular weakness it was decided to try the effect of neostigmine ('Prostigmin'),

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and she was given neostigmine bromide 1 mg. with atropine gr. $^1/_{100}$. This produced no significant change in the weakness of her sternomastoid muscles or the movements of her vocal cords, but her limb movements became slower and clumsy, and fibrillation developed in her shoulder-girdle muscles. She had some difficulty in protruding her tongue, and her speech became thick and slurred. The pulse-rate slowed from 74 to 54 after 20 minutes, but the electrocardiogram remained unaltered in form.

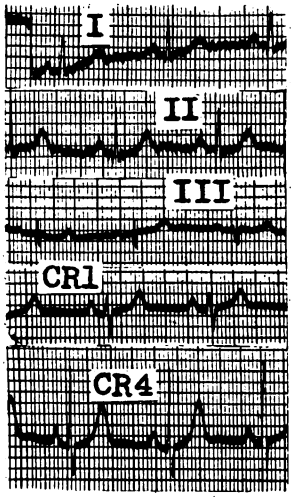

Fig. 2—Normal electrocardiogram 4 weeks later. (Time interval $^1/_5$ and $^1/_{25}$ sec.)

A week later she complained of more severe and persistent dysphagia, especially for solid food. Laryngoscopy showed no change in the paresis of the left vocal cord, and a barium swallow showed much delay in the pharynx. An injection of prostigmin 1 mg. and atropine gr. $^1/_{100}$ made swallowing still more difficult, with the result that a barium swallow lodged in the pharynx and remained there for more than fifteen minutes.

Two months after admission the left eye showed some proptosis but could be closed, there was slight right facial weakness, the sternomastoid muscles were a little stronger, the voice was still hoarse, and swallowing, though improved, was still difficult and slow. The precordial friction sound was just detectable. The cardiothoracic ratio was 0·45 : 1. The patient was discharged from hospital and was subsequently seen at intervals as an outpatient.

DISCUSSION

Exophthalmic Ophthalmoplegia.—The appearance of severe exophthalmos, followed later by progressive ophthalmoplegia, was in keeping with the usual experience that these serious complications start when thyrotoxicosis is under control, and are not arrested by treatment of the toxic symptoms. It first appeared about twelve years after the onset of thyrotoxicosis. That in the second eye developed when the condition had been relieved in the other, and when her thyrotoxicosis was adequately controlled with methyl thiouracil. The effects of testosterone, stilbœstrol, and thyroid extract on this aspect of her condition are being observed.

Chronic Thyrotoxic Myopathy.—It is impossible to exclude local involvement of the left recurrent laryngeal nerve by the thyroid as a cause of paresis of the left vocal cord, but probably it was part of a more general condition involving also the sternomastoid muscles, the muscles of deglutition, and facial muscles. Biopsy specimens of an ocular muscle and of a temporalis muscle were taken at operation; they showed the œdema usually found in such cases. Possibly the pathological changes in the affected muscles, which were all of cranial innervation, may have been identical.

The distribution of the myopathy is unlike that described by Russell Brain (1947) and conforms to that of the acute form (Brain 1947, Sheldon and Walker 1946). Laurent (1944) described acute thyrotoxic bulbar palsy, of which the present case might be described as a chronic variant. In view of Mulvany's (1944) ætiological classification of exophthalmic ophthalmoplegia into thyrotoxic and thyrotropic forms, and the parallelism between the development and progress of exophthalmos and myopathy in the present case, together with their lack of response to control of thyrotoxicosis, it is tempting to explain their behaviour on a thyrotropic basis.

Neostigmine increased the muscular weakness, in contrast to its effect in the acute form, in which it produced a beneficial effect comparable to its action in myasthenia gravis (Laurent 1944, Sheldon and Walker 1946). McEachern and Ross (1942) have demonstrated with myograms that improvement with neostigmine may take place in chronic thyrotoxic myopathy, but in their three cases the muscles of the shoulder and pelvic girdles were principally affected. Thorn and Eder (1946) described five cases which showed a similar distribution of the affection, but one also showed bulbar involvement. None showed any clinical improvement after neostigmine 1·5 mg., but two cases treated with thiouracil and one with 'Thiobarbital' showed dramatic improvement of the myopathy when the thyrotoxicosis had been relieved.

Wolff-Parkinson-White Syndrome.—Much has been written on this subject since it was originally described (Wolff et al. 1930) as "bundle-branch block with short P–R interval in healthy young people prone to paroxysmal tachycardia." Its association with thyrotoxicosis has been reported in six cases, and in four of these the abnormalities in the electrocardiogram disappeared after thyroidectomy (Jervell 1941, Lamb 1933, Master et al. 1937, Mihalkovics and Kovats 1943, Willis and Carrier 1946). In Lamb's (1933) case the abnormal electrocardiogram was again found with the return of a degree of hyperthyroidism.

The syndrome, however, is not very rare, being found in about 5% of patients subject to paroxysmal tachycardia (White 1946a citing Hunter et al. 1940); but the fact that its disappearance was related to the relief of thyrotoxicosis in four of the six reported cases and in the present case suggests that there may be some specific relationship. It has not apparently been reported previously as associated with thyrotoxic myopathy; hence the association in this patient is probably no more than accidental. There are many suggested causes of the Wolff-Parkinson-White syndrome, of which Öhnell (1944) discusses as many as thirty.

Precordial Friction.—This was first reported in association with thyrotoxicosis as "a superficial pericardial rub . . . most common over the pulmonary base . . . probably produced mechanically" (Goodall 1920). Colvin and Smith (1927) noted its incidence in 40–50% of their patients with hyperthyroidism, and that it always disappeared after a successful thyroidectomy, to return only in the few who later relapsed. Lerman and Means (1932) noted its incidence in 10% of their cases of thyrotoxicosis, and considered it might be related to the dilated pulmonary conus seen in these cases. Master et al. (1937) noted its presence in a case of Graves's disease with Wolff-Parkinson-White syndrome, in which fluoroscopy showed slight prominence of the pulmonary conus. White (1946b) states that pericardial friction sounds, particularly in the pulmonary-valve area, as in cases of pulmonary-artery dilatation in thyrotoxicosis, may be produced by normal pericardial surfaces rubbing against each other under unusual pressure. Since in this patient the pulmonary conus was radiologically prominent, and the sound almost disappeared when the thyrotoxicosis was controlled, this explanation, if accepted, would be adequate. There was, however, no appreciable alteration in the outline of the pulmonary conus in subsequent X-ray films, and such a radiological appearance is very often seen without a pericardial rub.

SUMMARY

Exophthalmic ophthalmoplegia, thyrotoxic myopathy, the Wolff-Parkinson-White syndrome, and pericardial friction occurred in the same patient as complications of thyrotoxicosis.

Treatment with methyl thiouracil was followed by disappearance of the cardiac complications, but the eye signs and the myopathy persisted.

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The muscular weakness, confined to muscles with cranial innervation, was temporarily increased by neostigmine.

The complications are briefly discussed.

It is a pleasure to acknowledge Dr. Laurent's encouragement in reporting this case. My thanks are also due to Mr. H. G. Blunt for the reproduction of the electrocardiograms.

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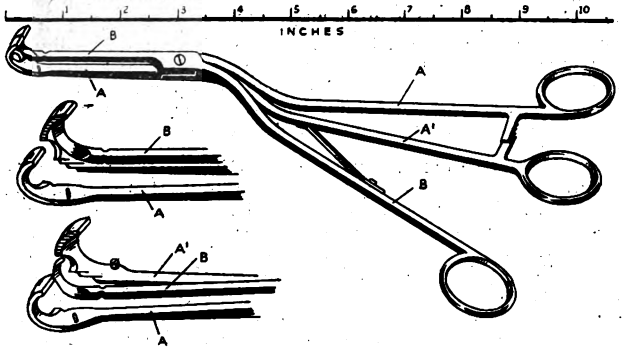
New Inventions

SYMPATHETIC AMPUTATION CLAMP

At Groote Schuur Hospital, Cape Town, we practise subtotal sympathectomy for the treatment of hypertension—i.e., removal of the sympathetic chain from D2 to L3 inclusive, plus the splanchnic nerves.[1] In this extensive procedure the surgeons often find great difficulty in dissecting and amputating the sympathetic chain safely at the required height. To overcome this difficulty an instrument has been devised which enables the chain to be fixed and amputated under full vision.

The instrument consists of three blades: two (A and A′) for embracing and one (B) for cutting the chain. The accompanying figure shows that the claws, A and A′;



are bent like a hook. A half-circle has been cut out of each, forming an aperture which, when closed, embraces the sympathetic chain without fixing the clamp on the chain itself. After dissection of the sympathetic chain and division of the rami, the clamp is applied at the most convenient point and guided to the uppermost or lowermost point. The sympathetic chain is kept tense by a slight pull with ordinary forceps and can be cut with blade B under full vision. The clamp may also be used with advantage to hold the sympathetic chain while it is being dissected.

Further points are that the blade (B) is protected throughout, lying in the bend of the one claw of the clamp. It is kept open by a spring. The heads of the claw have longitudinal grooves to keep the claws well in apposition.

The clamp, which is made by Messrs. Chas. F. Thackray Ltd., of London, can be obtained in various lengths, straight or bayonet-shaped, as illustrated. We have used the instrument in cervical, lumbar, and subtotal sympathectomies, and it may well be used in operations where similar structures have to be amputated at a great depth.

Department of Surgical Research, Medical School, Cape Town. R. H. GOETZ.

1. Goetz, R. H. *S. Afr. med. J.* 1947, **21**, 2; *Surg. Gynec. Obstet.* 1948, **87**, 417.

Reviews of Books

British Surgical Practice

Vol. IV. Editors: Sir ERNEST ROCK CARLING, F.R.C.S., F.R.C.P., consulting surgeon, Westminster Hospital; Sir JAMES PATERSON ROSS, M.S., F.R.C.S., director of surgical clinical unit, St. Bartholomew's Hospital, and professor of surgery in the University of London. London: Butterworth. 1948. Pp. 486. 60*s*.

VOLUME IV contains 36 sections, beginning with Facial Palsy and ending with Hiccup. The standard of the articles and illustrations—as the previous volumes have led us to expect—is of the first order. It is unfortunate that the section on fractures, a subject of difficulty for many general surgeons, covers only 66 pages; for though Mr. Holdsworth has made remarkably good use of his space, he has not been given enough of it. Professor Wilder Penfield, on the other hand, is allowed 17 pages to discuss focal epilepsy—a small enough quota, certainly, for his masterly account. But since the general surgeon will often have to tackle fractures and will seldom deal with focal epilepsy, the space allotted to the two subjects seems disproportionate. This Oliver Twist grumble does not touch the quality of the fare offered.

Tuberculosis of the Knee-joint

JOHANNES MORTENS. Translated by AXEL ANDERSEN. Copenhagen: Munksgaard. London: H. K. Lewis. 1948. Pp. 550. 37*s*. 6*d*.

AT first sight, the size of this formidable monograph appals; but interest is soon aroused, for Dr. Mortens describes in detail the pathology and clinical features of the disease, and then reviews the methods and results of treatment in 181 cases seen in two Danish hospitals—the Coastal Hospital at Refsnaes and the Finsen Institute—between 1919 and 1929, and followed up in 1940 to 1944. He gives the medical history of the treatment of this condition, and reviews the published results from clinics throughout the world. By careful analysis, factual rather than statistical, he justifies the methods he has used in his cases—namely, excision for adults, and conservative treatment for children, with modified excision for those over 9 years of age. Britain, along with the United States, is described as favouring radical treatment of the young. In this Dr. Mortens is surely mistaken, for few in this country go as far as he does in operating on 9-year-olds. The individual case-histories of his large series are set out by means of ingenious charts. Cross-references from his statistical tables (which appear rather daunting) lead the reader back to case-histories and thus make the figures personal and alive. Even those surgeons who have no special interest in tuberculosis of the knee-joint will be fascinated, as well as informed, by this book.

Hospital Trends and Developments 1940-1946

Editors: ARTHUR C. BACHMEYER, M.D., director, University of Chicago clinics; GERHARD HARTMAN, PH.D., superintendent, university hospitals, professor of hospital administration, State University of Iowa. New York: Commonwealth Fund. London: Oxford University Press. 1948. Pp. 819. 30*s*.

THE student of the future who wishes to follow developments in the American hospital field for the period 1940–46 will be grateful for this volume. Some 800 double-columned pages carry a selection of articles which have appeared in the principal periodicals. The editors believe that there has been a noticeable improvement in the quality and quantity of professional writing in the hospital field. "There is evidence of more objective comprehension and objective analysis of hospital problems as against the highly personalized experience of individual administrators in individual situations, such as characterized the bulk of previous written expression." There has certainly been an increase in volume and there is certainly a good deal of valuable material embedded in it; but not infrequently the "objective analysis" appears to the English reader to be largely verbal, and to fall short of the standard set in America by Dr.

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Goldwater. The editors could, with advantage, have been more ruthless in their standard of selection.

The first part deals with current trends in very general terms; but events are moving so fast in the hospital world that much that is here reproduced is already outdated. Thus space has been found for Lord Dawson's paper on Medicine and Public Welfare (*Brit. med. J.* 1942, i, 573). This was a notable contribution at the time, but is now mainly of historic interest. Recent British developments are scarcely touched in the chapter on hospital developments in foreign countries; a short article written in 1944 by Mr. Graham Davis (of the Kellogg Foundation) and an earlier review of post-war British medicine by the late Sir Frederick Menzies dated November, 1942, cannot be said to be adequate to cover a period so full of trends and developments in British hospital affairs, and so fraught with significance for American hospitals.

"The trustee" figures prominently. Membership of the board of the hospital is taken very seriously in America, but plainly questions are now being asked about its composition: "Usually absent from the roster are those who may be said to represent the laboring groups of the community. Often it is from these groups that the agency or institution is drawing its patients or its clients." . . . "Likewise missing are representatives of social points of view that deviate from the orthodox mean represented by existing board members. The liberal lawyer, teacher, clergyman, or social worker is not there." The remainder of the volume is made up of articles on a great variety of hospital topics—from nursing to medical records, and so to personnel management, public health, regional planning, and much else.

The book gives a good bird's-eye view of American progress; but one of these days the Commonwealth Fund (to which we in this country owe so much) should sponsor a serious attempt to bring together a similar volume of material at once more compact and better calculated to open the eyes of the American hospital public to the progress being made in Great Britain and many other parts of the world.

The Story of Scabies

Vol. I. REUBEN FRIEDMAN, M.D., associate professor of dermatology and syphilology, Temple University. New York: Froben Press. 1949. Pp. 468. $7.50.

Dr. Friedman is well known as the author of over twenty books on scabies. This volume is not entirely new, being made up of two of his previous works, *Scabies, Civil and Military*, and *Biology of Acarus Scabiei*, both carefully revised and with some additions. There are complete statistics of the incidence of scabies; and reproductions of most of the historic illustrations of the acarus, its larvæ and burrow. Prevention and treatment of the disease have not been neglected, and there is a full section on the biology of the mite with comprehensive drawings and some truly remarkable photomicrographs of its life cycle. Since the acarus has a powerful fascination, this is not a book to pick up for reference during a busy surgery, but rather one to take home and read and enjoy at leisure.

Psychosocial Medicine

A Study of the Sick Society. J. L. HALLIDAY, M.D. London: Heinemann Medical Books. 1948. Pp. 277. 17*s.* 6*d.*

FOR eight years before the war Dr. Halliday acted as a medical referee, examining many thousands of persons who received sickness benefit. His experience convinced him that illnesses in which emotional disturbance was the predominant cause were far more common and important than had been generally realised. He became an enthusiastic proponent of "psychosomatic medicine," and adopted the psychopathological modes of thought and language current in that field. He remained, however, true to his earlier education in preventive medicine and public health, and decided that the concepts of psychosomatic medicine could be applied to the illness of communities and social groups. The indices of social sickness which he classifies are: declining fertility; increasing incidence of psychosomatic affections and their gradual appearance at an earlier age; loss of distinction in psychological sexual characteristics; increase in sickness-rates, absenteeism, unemployment, strikes, and decline in output per worker; more juvenile delinquency; social fragmentation, group dispersal, helplessness; loss of self-respect; increasing intrusion of sex and other "manifestations of the primitive and visceral"; increasing intellectualism and obsessional planning, decline of vital religious faith, increase in "escapism" as in mass gambling and showgoing. The use of the term "health" for the body politic is old, and many moralists have turned the analogy between a sick man and a sick society to good account: but it is patently dangerous for physicians to judge how "sick" society is by indices which seem in part to reflect private dislikes. Echoes of Nordau are heard by an elderly reader as Dr. Halliday rehearses the signs of a decadent society. With his thesis that the sickness of individuals commonly reflects their psychological as well as their physical environment there can be no quarrel: it is his merit to have made it more widely acknowledged. But it will be necessary to examine more closely and objectively the evidence as well as the criteria for a "sick" society—assuming that our society has ever been in this sense "healthy." Nevertheless, this book is a stimulating and sincere contribution to social medicine.

Papers on Psycho-Analysis (5th ed. London: Baillière, Tindall, and Cox. 1948. Pp. 504. 31*s.* 6*d.*).—Dr. Ernest Jones, the chief survivor of the notable group who became Freud's pupils in the early days of psycho-analysis, and by their prolific writings and devotion contributed much to the development of the subject, is now president of the International Psycho-analytical Association. This fifth edition of his selected articles differs from the previous edition in that fourteen papers have been dropped and nine more recent ones included. Some of the latter deal with war conditions and with the relationship of psycho-analysis to medicine and to psychiatry. Dr. Jones dissents from the environmentalists, within and outside psycho-analytical circles, who have lately urged that more importance should be attached to cultural traditions, and other social forces, in determining the early development of children and therefore their later psychic structure. In the main, he identifies himself with the standpoint of Melanie Klein. His style is lucid; if all psycho-analytic writing had been as carefully and intelligibly expressed, he would probably not have had to say that "the habit of reading has certainly declined among analysts in the past twenty years and correspondingly the habit of writing has taken on a more narcissistic bent."

Athletic Injuries: Prevention, Diagnosis and Treatment (3rd ed. London: Henry Kimpton. 1948. Pp. 243. 18*s.* 6*d.*).—The average athlete who has sustained some disability wants an impossibly speedy restoration to full activity. This experience is reflected in Dr. Augustus Thorndike's observation that "athletic seasons are short and players valuable, the doctor is racing against time in order to return an injured player as soon as possible to his team." And again "Of the more serious injuries in modern athletics, fractures and dislocations rank high. Not so much from the seriousness of fractures as from the time lost from sport." Yet his repeated insistence on the orthodox principles of surgical procedure seems at variance with this sympathetic appreciation of athletic requirements. Where premature activity is only too readily undertaken, he emphasises the importance of protracted rest. He deprecates the packing in ice (in the early stage) of sprains and strains since it readily gives rise to superficial phlebitis, a mild degree of frost-bite. On several occasions he alludes to the frequency with which muscular contusions are followed by myositis ossificans. An elaborate statistical summary shows the various lesions encountered. Fractures of the spine rarely involve more than the transverse or spinous processes. Internal injuries are comparatively few, but 5% of deaths from American football resulted from skin injuries. "This," says the author, "is preventable." A rather remarkable observation is that no case of acute appendicitis occurred among 16,000 athletes in active training during fifteen years. Dr. Thorndike, who is chief surgeon to the Harvard University Athletic Association, suggests that athletic training produces the most perfect resistance as far as the production of antibodies against infection goes. This is certainly not the experience in this country of those who have had the care of athletes.

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THE LANCET

LONDON: SATURDAY, JUNE 4, 1949

The Disappointed

THE professional reviewing committees set up by the hospital boards to assess the individual professional status of the medical and dental staff have now finished their work. During the past week every doctor concerned should have been notified of his personal assessment, and the status in which he will be offered, in due course, a permanent contract. Inevitably there have been many disappointments. In the absence of any clear definition of the requirements for the highest group, it was natural for most of the existing staffs of hospitals to hope for inclusion; and many of these hopes have not been fulfilled.

More than once in the past, attempts have been made by the Royal Colleges and by other bodies to find acceptable criteria sufficiently definite to allow the compilation of a roll of recognised specialists; but agreement was never achieved. Hence the reviewing committees had to set their own standards; and a study of the first regional assessments available shows that these were high. The committees had to choose between two opposite approaches to their task. On the one hand, they could say: "A specialist service is needed in all parts of the kingdom; we must help to provide it; and the coat must be cut from the cloth. Therefore in the initial stages optimum and ultimate standards will have to be relaxed, and we must recognise as specialists many practitioners of lower calibre than we would prefer and will eventually require, replacing them, when their time has run, by men who will be better trained and better equipped for their specialist duties." On the other hand, the committees could say that a man should not be dubbed a specialist unless his training and experience was already such as to have made him well-informed in the theory of his chosen specialty, practised and skilled in its techniques, balanced in his judgment, and fully equipped to give the specialist help required and expected by his colleagues in hospital or in general practice whenever they call on him. It seems clear that this second approach is the one the reviewing committees have followed, and that they have insisted on being satisfied of a high degree of academic and professional achievement before allowing any practitioner to pass their scrutiny and be admitted into the group of the recognised specialists.

As a long-term policy there is no doubt that this policy is the right one; but its present acceptance has unpleasant consequences. In the first place, the number of men and women falling unquestionably into the specialist category, as thus interpreted, is comparatively small. Many at present regarding themselves as specialists, and practising exclusively as such, do not qualify for the title, and a place has had to be found for them elsewhere in the hierarchy. The category considered suitable for them is that of senior hospital medical officer; but their inclusion here has in turn its effect on the classification of the "general-practitioner specialist." It was widely supposed that most of these general medical and dental practitioners who for part of their time undertake specialist and hospital duties would be included in the S.H.M.O. group, while a few would find a place among the specialists. In point of fact hardly any men still engaged in general practice have been designated specialists, and only a minority of them are placed in the S.H.M.O. group: the rest find themselves in the vague and uncomfortable position of being "unclassified." It should be recognised, however, that the general medical practitioners who make up almost the whole of this unclassified group are unlikely to suffer materially thereby. Even to staff a hospital service no greater than we have at present, the establishment could not be provided without enlisting the part-time services of most of these men. Classified or not, they will presumably have to be offered contracts in the hospitals, and the appropriate arrangement seems to be that of section 8(b) of the proposed terms and conditions of service of hospital staff. This allows for remuneration at the rate of £175 per annum per weekly "half-day" (up to a maximum of £1575)—a sum that compares very favourably with the £100 per annum per weekly session now being paid to general-practitioner clinical assistants; and one that also falls little short of the estimated figure per "half-day" at present offered to the S.H.M.O. We would emphasise "at present"; for it is more than probable that, if specialists can be persuaded to accept the grading of so many of their number as S.H.M.O., they will have much to say about the consequent inadequacy of the scale of remuneration suggested for this group.

Few general practitioners will be able satisfactorily to undertake enough weekly sessions of specialist work for this to become the major source of their income. Very different, however, is the case of the man doing specialist work only. For him the difference in grading between specialist and S.H.M.O. is of great importance. As S.H.M.O., not only is his rate of remuneration smaller, and his ultimate ceiling of income lower, but his chances of private and extrahospital practice are greatly reduced, especially as it is not yet clear whether men in this category will ever be allowed to undertake domiciliary consultations in the health service. And of course he will receive no ticket of entry to that new and attractive professional lottery whose prizes are the distinction awards. Though we can be sure that no practising specialist has been relegated to this lower category without careful thought by the reviewing committees, it is obvious that in so vast an undertaking there are bound to be some errors and some anomalies; and for this reason it

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has been decreed that any doctor who disagrees with his personal grading can ask the board for its reconsideration. We understand that the boards have no wish to discourage such appeals, and indeed would welcome them wherever there is thought to be just cause for discontent. Many of the would-be appellants, however, will feel themselves at a great disadvantage on two counts: firstly, their only court of appeal is the self-same committee that has already decided on their downgrading; and, secondly, not knowing on what grounds their original application for specialist status failed, they will have little to tell them what extra facts or arguments will have to be deployed if the present assessment is to be upset. They have scant faith or hope; they expect few changes of verdict; and they are afraid that they will have to serve long terms—if not life sentences—in the category to which they have already been committed. Justice would more manifestly be done if the appeals could be heard by new committees, even though these new bodies might need to draw on the old for some of their members.

As things stand, to many of the present specialists (excluding the trainee specialist, for whom special reviewing arrangements are made) the chance of appeal now open will virtually be their last opportunity to seek upgrading. No mention is made of any future review of status except where a man successfully applies for a new post, in which case the appointments committee selecting him will also reconsider his grade. Not only is this unfair but it will make for restlessness, and for changes of appointment for reasons irrelevant to the work. What is required is a mechanism whereby the status of men in all but the most senior grade can be reviewed at recognised intervals, even though they seek no change of post or place. Moreover, if they fail to gain promotion they should, if they so demand, be given some indication of the professional discipline they should follow in the interval (which may well be one of years) before their next opportunity of reassessment arrives, if they aim to increase their usefulness to the service and raise their status. We shall never build a service that will run smoothly, happily, and efficiently if an appreciable proportion of its members find themselves from an early age destined to fill the rôle of sempiternal subalterns. We need not have come through such travail had we always intended to make our new Jerusalem more rigid than the old, and give to each aspiring specialist his preordained estate, the rich man in his citadel, the poor man at his gate.

Surgery in Cardiac Ischæmia

THE rising incidence of cardiac ischæmia and its grave prognosis have stimulated cardiac surgeons to examine a wide variety of measures which might bring relief. These procedures can be broadly divided into two groups, according to whether their main aim is to reduce the pain of angina pectoris or to improve the blood-supply of the heart muscle.

The innervation of the heart has not been accurately worked out, and operations which require nerve section or removal are usually designed on a lavish scale to include all possible nerve-fibres. Relief of cardiac pain can be effected by interrupting the preganglionic or postganglionic fibres, by either dividing the white rami of the upper dorsal nerves or excising the inferior cervical ganglia and upper dorsal sympathetic trunk. The afferent pain fibres accompany the cardiac sympathetic nerves to reach the spinal cord in the dorsal region. The influence of the sympathetic nervous system on the coronaries is uncertain, but its stimulation probably increases their tone. Consequently division of the sympathetic fibres (denervation of the heart), besides cutting off the afferent pain fibres, should prevent too great acceleration and rise in blood-pressure and reduce the spasm of coronary vessels. SACCOMANNO and his colleagues [1] contend that excision of the 2nd, 3rd, and 4th dorsal ganglia should produce the required result, and this is supported by RANEY,[2] who was successful in 11 cases on this basis. On the other hand, a more extensive procedure is usually practised and the figures of WHITE and BLAND,[3] who injected alcohol and procaine into the upper four thoracic ganglia, are impressive: good results were achieved in three-quarters of their 75 cases for periods of 3 months up to 5 years. The injection is made into the chain at the side of the vertebræ, avoiding the intercostal nerves and arachnoid space. It is a bilateral procedure requiring considerable skill if obvious complications such as injury to the pleura are to be avoided, and a more deliberate approach or exposure is often preferred. The sympathetic chain can be approached anteriorly at the base of the neck over the pleural dome or posteriorly after resection of the 2nd rib and transverse process. LINDGREN and OLIVECRONA [4] record satisfactory results from operative excision in over 70 cases, and there are other series which support their claims. A criticism of sympathetic operations is that the abolition of pain may remove the warning that strain is being put on the heart; but there is still a sense of oppression and discomfort which the patient cannot disregard. Another nerve operation that has been done is posterior rhizotomy, in which, after laminectomy, the upper four dorsal roots on each side are divided. This operation has the advantage that both sides can be dealt with at the same time; but it is more severe than ganglionectomy, and particular care must be taken of the blood-vessels in the region since myelitis from damage to the blood-supply of the spinal cord has been recorded.

The various attempts made to improve the blood-supply to the myocardium may be classified under three headings:

(1) Production of inflammation on the surface, or grafting of vascularised tissue such as omentum or lung on to the surface of the heart, so that small anastomotic channels form between adherent tissues and the coronary vessels.

(2) Partial occlusion of the coronary sinus, so that the venous blood from the heart is not drained away too quickly.

(3) Formation of a new anastomotic channel between a systemic vessel and the coronary sinus, so that arterial blood is introduced into the venous channels of the heart muscle.

The earlier workers on improving the collateral circulation of the myocardium applied pedicled muscle

1. Saccomanno, G., Utterback, R. A., Klemme, R. M. *Ann. Surg.* 1947, **125**, 49.
2. Raney, R. B. *J. Amer. med. Ass.* 1939, **113**, 1619.
3. White, J. C., Bland, E. F. *Medicine*, 1948, **27**, 1.
4. Lindgren, I., Olivecrona, H. *J. Neurosurg.* 1947, **4**, 19.

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grafts (BECK [5]) or omentum or lung (O'SHAUGHNESSY [6]) to the surface of the heart. Some successes were achieved, though in general these operations have not found much favour. Simple vascular adhesions can be produced by introducing asbestos powder or bone dust into the pericardium, but here again the anastomosis cannot be expected to do more than give slight relief. A study of the venous drainage of the heart has shown that back-flow from the coronary sinus will reach the myocardial capillaries, and that if a systemic artery can be grafted into the sinus real improvement in the blood-supply to the heart may be expected. Numerous experiments in dogs have been carried out by BECK and his associates,[7] STENSTROM,[8] and others. BECK finally achieved an anastomotic channel in man by means of an arterial graft between the aorta and coronary sinus. He resected a length of the brachial artery and united one end by an end-to-side anastomosis with the aorta (using a Potts clamp) and joined the other end to the coronary sinus. The experimental work showed that, after such an anastomosis was functioning, ligation of the descending branch of the left coronary artery was less likely to produce infarction. STENSTROM, using many channels in dogs, found that there was a distinct danger of myocardial ecchymosis, presumably because the veins could not support the pressure of systemic blood that was introduced into them. GROSS [9] showed similarly that the incidence of experimental infarction was greatly reduced by a previous anastomosis, and he has introduced a further innovation in the use of human arterial grafts taken from patients who have died suddenly. These grafts, carefully stored, have been used successfully in 7 cases of Blalock's operation and in 3 patients with coarctation in which the gap after resection was too wide to allow of direct union. It seems possible that this work will provide a new source of tube-grafting material. A different approach has been advocated by FAUTEUX,[10] who ligates the coronary sinus and at the same operation performs a periarterial sympathectomy on the coronary vessels with the object of preventing too rapid venous drainage and dilating the arteries supplying the heart. Some satisfactory results have been achieved along these lines.

Another aspect of angina pectoris which the surgeon has to consider is its relation to the performance of operations on other parts of the body. Anginal pain is evidence of coronary insufficiency, and the insufficiency only occurs with a diseased artery. Myocardial failure in these patients is the result of muscle ischæmia, and its site and extent has an important bearing on the prognosis. The scarring of an infarct (if the patient survives) may take 3–4 months, and if pain persists it is probable that no adequate collateral circulation has formed. If possible 12 months should be allowed between the formation of an infarct and any major operation, but a risk has often to be taken after a much shorter interval. In these cases the skill of the surgeon and the experience and judgment of the anæsthetist will be heavily called on.

5. Beck, C. S. *Ann. Surg.* 1943, **118**, 788.
6. O'Shaughnessy, L., Slome, D., Watson, F. *Lancet*, 1939, i, 615.
7. Beck, C. S., Stanton, E., Butluchok, W., Leiter, E. *J. Amer. med. Ass.* 1948, **137**, 436.
8. Stenstrom, J. D. *Canad. med. Ass. J.* 1948, **59**, 420.
9. Gross, R. E., Hurwitt, E. S., Bill, A. H. jun., Peirce, E. C. *New Engl. J. Med.* 1948, **239**, 578.
10. Fauteux, M. *Amer. Heart J.* 1946, **31**, 260.

The Female Bleeder

MOST doctors and dentists have been faced with the woman patient who declares that she is a "bleeder," and the statement is often backed with a circumstantial family history. To most members of the public a "bleeder" is someone who suffers from hæmophilia, and it is odd that the fact that females are not affected has penetrated so little. Theoretically, if a male hæmophiliac marries a female hæmophilia carrier, a daughter could be hæmophiliac too. But the many surveys that have been made have not revealed any female with an unquestionable hæmophilia. BULLOCH and FILDES,[1] in their classical survey of 600 hæmophilia families, did not find a single affected female. BIRCH [2] had details of 78 American hæmophilia families without any affected women members. The present view is that the combination is lethal and that the female hæmophiliac, if ever conceived, dies in utero at an early stage. What then is the nature of the bleeding that troubles these women? Most of them complain of excessive hæmorrhage after tooth-extraction. But a little questioning reveals that the bleeding, though distressing, did not last for as long as 48 hours, and usually one dressing sufficed to stop it. These incidents, trying as they are, are not due to blood disease—all the various tests of coagulability and for platelets are normal—but to dental trauma; some patients' gums are more easily damaged than others. If the bleeding lasts more than 48 hours, or if serious bleeding starts on the third or fourth day after the extraction, further investigation is called for. One pitfall that must be avoided is the patient who has a primary blood disease. Such patients are not often chronic "bleeders," but many cases of leukæmia have been diagnosed because a blood-count was done after excessive dental hæmorrhage.

There is a group of hæmorrhagic patients usually diagnosed as having "pseudo-hæmophilia," who have serious difficulties with minor surgical incidents like tooth-extraction but often pass safely through major abdominal operations. When such a patient has a tooth extracted there is little bleeding at first and it soon stops. But three or four days later bleeding begins in earnest; a large blood-clot gathers in the mouth, to the patient's great discomfort, and if the clot is removed bleeding starts afresh. The usual methods of pressure dressings, viper venom, fibrin foam, and other coagulating applications all fail. Blood-transfusions are soon needed to keep up the hæmoglobin level, and it may be anything from two to six weeks before the bleeding finally ceases. Altogether this syndrome is more difficult to deal with, and more dreaded, than true hæmophilia. There are well-authenticated examples of this syndrome in females, and it is known to be familial in many cases. The coagulation-time and prothrombin concentration of the blood are usually normal, and so are the platelets; but the bleeding-time may be prolonged. The cause of some of the cases is undoubtedly, as MACFARLANE [3] showed, a failure of

1. Bulloch, W., Fildes, P. Treasury of Human Inheritance. London, 1912; vol. i, p. 169.
2. Birch, C. L. Hemophilia: clinical and genetic aspects. Illinois Medical and Dental Monographs. 1937; vol. i, no. 4.
3. Macfarlane, R. G. *Quart. J. med.* 1941, **10**, 1.

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proper capillary constriction after damage, and this can be demonstrated in some, but not all, patients by observing the reaction of the nail-bed capillaries.

Finally there is a very rare group of women with hæmorrhagic syndromes very closely resembling hæmophilia. HEWLETT and HADEN [4] describe two examples. One was a woman of 40 who had had a hæmorrhage into the base of the tongue causing pain and difficulty in swallowing; she had had big subcutaneous hæmorrhages in various parts of the body and hæmaturia; after a tooth-extraction there was a widespread hæmorrhage into the tissues of her jaw. But she had had no menstrual disorder and had given birth to five children without unusual bleeding. On one occasion the coagulation-time of her blood was almost 2 hours and the coagulation-time of recalcified plasma was seven times normal; such findings are said to be pathognomonic of hæmophilia —but a year later both tests gave normal results. The second patient was a woman of 33 who had bleeding into joints and had had large eccyhmoses in various parts of her body. She also had a normal menstrual history and had had a normal full-term pregnancy without undue trouble at delivery. Her coagulation-time was nearly 3 hours, and the coagulation-time of recalcified plasma was also much increased; her coagulation-time was still nearly 2 hours six months later. Neither of these women had any family history of bleeding. HEWLETT and HADEN refer to a few similar cases reported previously without any explanation. In their own patients electrophoretic methods showed a curious lowering of alpha-globulin below normal proportions; they therefore suggest that the women had acquired an abnormality of their plasma proteins which was upsetting normal blood coagulation. It is a pity that they could not estimate the prothrombin consumption during blood-clotting, since QUICK [5] pointed out that in hæmophilic blood there is no detectable consumption. HEWLETT and HADEN looked carefully for circulating anticoagulants but found none. It is only recently that we have learnt that circulating anticoagulants, having properties resembling heparin, can be found in some patients with abnormal bleeding. ALLEN and his co-workers [6] have described a group, all women, who had episodes of abnormal bleeding associated with an increase in the "protamine titration" figure of the blood but rarely with an increased clotting-time. In some of these patients the bleeding ceased after parenteral doses of protamine sulphate or toluidine-blue. These substances are known antiheparins; so it has been suggested that the patients have an excess, possibly temporary, of circulating heparin in their blood.[7] But ALLEN et al. point out that the reaction with heparin is not specific; these two substances will also inhibit the mild anticoagulant properties of other endogenous substances like nucleic acid; they therefore cautiously describe the clotting disturbance as "heparinoid." This subject is only just beginning to be explored, and it may well be that some of the female bleeders will be assigned to this "heparinoid" group.

4. Hewlett, J. S., Haden, R. L. *J. Lab. clin. Med.* 1949, **34**, 151.
5. Quick, A. J. *Amer. J. med. Sci.* 1947, **214**, 272.
6. Allen, J. G., Grossman, B. J., Elghammer, R. M., Moulder, P. V., McKeen, C. L., Jacobson, L. O., Pierce, M., Smith, T. R., Crosbie, J. M. *J. Amer. med. Ass.* 1949, **139**, 1251.
7. Annotation, *Lancet*, 1947, **1**, 718.

There is thus nothing in the information gained from newer techniques to disturb the long-held opinion that true hæmophilia does not occur in the female. There are female "bleeders," but fortunately they are rare, since it may tax all the resources of the modern laboratory to sort out their ætiology. Meanwhile, the practitioner will be safe, if he applies the "48-hour rule" and sends to a special clinic all whose bleeding extends beyond this limit.

Annotations

SCIENCE ON PARADE

SCIENCE has long since emerged from the phase of simple observation, and the recent advances illustrated at last week's conversazione at the Royal Society were as remarkable for new techniques as for the discoveries to which they have opened the way. For example, M. Henri Lyot, of the Paris Observatory, has achieved a satisfactory artificial eclipse for the purpose of taking a cinematographic record of the sun's limb; and a film, made in the U.S.A., showed columns of flame shooting hundreds of thousands of miles out from the sun's orbit. Usually these sheets proceed in parabolic fashion, perhaps related to the magnetic fields at sunspots, but sometimes they disappear into space; and, even more remarkable, they appear sometimes to form in space and descend on the sun. Down to earth again, visitors saw a demonstration of phase-contrast microscopy by a simple technique using a routine microscope; and also, so to speak, in this field, a micromanipulation apparatus, made from materials costing about £3, that might be marketed for about £20. Also present, to represent medicine, were electron-microscopic photographs of the influenza virus and a demonstration of vitamin B_{12} being prepared by partition chromatography from liver—a pinch of the crimson crystals from half a ton. Graphic X-ray pictures of the xenopus toad showed that the amphibian is no less liable than man and his dog to the effects of vitamin-D deficiency. But the exhibit that caught most eyes was an electrical relay machine that took on all comers at noughts and crosses; the human protagonist could hope for a draw but never a win, so the demand for replicas is unlikely to be great.

A NEEDLE-LESS INJECTOR

FOR nearly a hundred years doctors have regarded the hypodermic syringe as second only to the stethoscope in importance. No-one could imagine medical practice without either. The invention of the hollow needle by Wood in 1853 made the parenteral administration of drugs possible and revolutionised therapeutics; but it also introduced a new phobia, the "fear of the needle." For the sake of the patients who wince when their skin is pierced, hypodermic needles have been made sharper and finer, but a fine needle increases the difficulty of injecting viscous solutions and the danger of the shaft snapping off short. A new American instrument—the 'Hypo-Spray' or 'Jet Injector,'[1]—now in the last stages of evolution, may largely supersede the hypodermic syringe and needle and remove most of the disadvantages associated with them. The hypo-spray deposits a sterile solution of a drug in the subcutaneous tissues by forcing it through the skin in a microscopically fine jet. The instrument is little larger than a hand torch. The solution to be injected is contained in a small round-nosed metal ampoule—the 'Metapule'—which has an orifice about 75 microns in diameter at one end. The sterile metapule is placed in the hypo-spray without contamina-

1. Figge, F. H. J., Barnett, D. J. *Amer. Pract.* 1948, **3**, 107. Hingson, R. A. *Anesthesiology*, 1949, **10**, 66. An early report appeared two years ago; see *Lancet*, 1947, **1**, 732.

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tion. The skin is sterilised in the usual way; the orifice in the metapule, projecting from the hypo-spray, is pressed against the skin; and a powerful spring inside the instrument is released. The pressure generated (125 lb. of spring pressure acting on a plunger 0·5 cm. in diameter) forces the liquid through the tiny orifice of the metapule and through the skin into the subcutaneous tissues. The jet is but 1/136th of the bore of a 20-gauge needle, and the amount of trauma it causes in penetrating the skin is so minute that it produces practically no pain. During the injection the hypo-spray must be kept immobile, or the tiny puncture in the skin may be converted into a slit.

The instrument should be of great value in nervous patients, particularly children.

CARDIOPATHIA ARTEFACTA

THE Mackenzie school of cardiology has always been renowned for its outspokenness. This tradition is fully sustained by Dr. William Evans, who has lately been appointed physician to the London Hospital cardiac department—a post originally created for Sir James Mackenzie.

The irreparable damage caused by the diagnosis of heart disease where none exists has always been a favourite topic with Dr. Evans; and in a lecture to the Royal Australasian College of Physicians [1] he has returned to the attack with renewed force and frankness. One cannot help wondering, however, whether this time a good case is not being overstated. Is it still true that "tens of thousands of school-children are condemned each year" to a life of needless invalidism? (The only evidence presented in the lecture in support of this statement is that normal hearts were found in 60% of the Essex school-children referred during the past six years for re-examination because of "abnormal signs in the cardiovascular system at a school medical examination.") Then again, it seemed doubtful whether candidates for life assurance are "often" rejected because of harmless murmurs, or made to pay higher or loaded premiums. Discussing the effort syndrome, Dr. Evans says that "it is time it was called by its proper name—neurosis—and this by itself may have a desirable effect in treatment, for the term may be so repellent to the patient as to stimulate his resolve to overcome his symptoms." But ought a diagnosis of a neurosis to be made any more repellent to the patient than a diagnosis of, say, mitral stenosis? It is reassuring, in a way, to be told that substernal pain closely related to exertion is "less often an expression of coronary artery disease than of some trivial complaint like flatulent dyspepsia"; but it would be a pity if this reassurance led any doctor to refuse the severe diagnostic test often set by such pain. Likewise all will agree that headache, tinnitus, and giddiness may be "characteristic complaints of the neurotic," but only a brave man would deny that they may also be manifestations of hypertension.

In teaching and discussion it is always hard to avoid over-simplification and dogmatic statement, which certainly have their uses. But there can be danger in the obiter dicta of authority if they are misapplied as a substitute for the laborious process of thinking about each particular patient. In cardiac diagnosis and prognosis for example, the symptoms and signs—whether clinical, radiological, or electrocardiographic—are pieces in jigsaw that cannot be fitted together without taking thought. The teacher is often faced by the dilemma that if his utterances are strong enough to provoke thought they may also be strong enough to suppress it.

On all these subjects we could do with more facts, and a few have just been provided by Paul White and his colleagues [2] in America. They give the findings of their re-examination of 303 young men who were originally rejected for military service, because of a diagnosis of cardiovascular disease, but were later passed as fit by special cardiovascular boards in 1943.[3] At the time of re-examination in 1947 only 4 had valvular lesions indicative of rheumatic heart disease which had not been present in 1943. In 1947 a diagnosis of neurocirculatory asthenia was made in 7 men who in 1943 had been passed as normal. As was to be expected, the greatest difficulty lay in deciding the significance of transient hypertension and of transient tachycardia. The basis of the diagnosis of the former was a systolic pressure of over 150 mm. Hg and a diastolic pressure of over 90 mm., settling after half an hour's rest. Of 67 men with transient hypertension in 1943, 33 had normal pressures in 1947, 17 still had transient hypertension, and 17 had sustained hypertension. Conversely, 13 men with normal pressures in 1943 had transient hypertension in 1947, and 10 had sustained hypertension.

RADIOCARDIOGRAPHY

NEW methods for the study of hæmodynamics in the human heart still grow apace. Cardiac catheterisation continues to yield an immense amount of new and sometimes surprising information. Angiocardiography outlines the chambers of the heart separately, and its value in revealing the anatomical abnormalities of congenital heart disease is only now being fully exploited. Electrokymography [4] permits estimation of the speed of filling and emptying of the left ventricle, and it will also allow estimation and graphic recording of the movements of other parts of the cardiac silhouette. Prinzmetal and his colleagues [5] have now added radiocardiography. This is a method of recording graphically the passage of radioactive blood through the heart chambers by means of a specially constructed ink-writing Geiger-Muller counter. A carefully shielded Geiger-Muller tube is placed over the heart, and the counts emitted by radiosodium passing through the heart are recorded as rising and falling curves of concentration. The dose (0·1–0·2 millicurie of radiosodium) is rapidly injected into a vein at the elbow, with special attention to the avoidance of any lag in the systemic veins. In normal subjects a peak of concentration is recorded over the right ventricle within 2–3 seconds. A lower peak follows some 5–7 seconds later over the left ventricle. This falls away slowly in a further 5 or 6 seconds. Tracings are shown of the delay which occurs in cardiac failure, and also of the excessively rapid circulation found in thyrotoxicosis. This method is clearly a great refinement on previous methods devised for the study of circulation-time. The interpretations offered by Prinzmetal and his colleagues are perhaps a little disarming in their simplicity. The second peak over the left ventricle is often poorly defined and the "emptying time" apparently prolonged. This is interpreted as a hold-up in a poorly functioning dilated left ventricle. It may, however, be equally well interpreted as dilution in a sluggish pool of blood in the engorged lungs with slow access to the left ventricle of the radioactive material. This dilution effect is clearly seen in one of the published tracings, where heart-failure was extreme and the concentration was only slowly built up in the right ventricle; thereafter no change in concentration occurred over a period of some 35 seconds.

This work brings home to all in a graphic fashion the meaning of time-concentration curves in the cardio-

1. Evans, W. *Proc. R. Aust. Coll. Phys.* 1948, 3, 101.

2. White, P. D., Levy, R. L., Kerr, W. J., Stroud, W. D., Fenn, G. K. *J. Amer. med. Ass.* April 16, p. 1049.
3. Fenn, G. K., et al. *Amer. Heart J.* 1944, 27, 435.
4. Boone, B. R., Chamberlain, W. E., Gillick, F. G., Henny, S. C., Oppenheimer, M. J. *Ibid.* 1947, 34, 560.
5. Prinzmetal, M., Corday, E., Spritzler, R. J., Flieg, W. *J. Amer. med. Ass.* 1949, 139, 617.

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vascular system. Circulation-times have often been too glibly interpreted in the past. Prinzmetal's new methods will enable us to make better use of such measurements, since it is bound to lead to a better understanding of what is going on. All circulation-time techniques are somewhat comparable to pouring a lot of dye or other visible indicator into the tributary of a river; on reaching the main stream the dye is at once diluted by the conference of other large tributaries. The stream then broadens into a (pulmonary) lake of variable dimensions, and we usually note the circulation-time by subjective recognition of the indicator at some arbitrary point following exit from the lake. Prinzmetal's method narrows down the problem to concentration of the indicator substance and speed of passage in the main stream at the points of entry and exit from the lake. The reduction of the variables is an immense advantage, and when the new method is combined with other methods of observing the pulmonary circulation it should yield a rich harvest of new data for the better understanding of various forms of circulatory failure.

TAKING US ALL ROUND

IMPRESSED by the danger that in a scientific age we shall learn to look at things rather than people, Dr. Iago Galdston [1] pleads for "comprehensive medicine." The term has other meanings than the one he chooses for it, and he did, at first, consider calling his concept "eubiotic" medicine. "But," he says sadly, "very few took to the term, and more seemed to prefer comprehensive medicine." This type of medicine, he suggests, is not content to cure disease, but postulates that a man may be cured of his disease and remain in bad health. It rejects as barbaric the notion of specific ætiology, recognising that many factors operate to produce pathological processes. "The more advanced students in comprehensive medicine employ with extreme caution and only for convenience the term and concept of causation." They find no clear line between sickness and health, but see these as degrees of functional efficiency. Nor do they grant the existence of specific therapies, though they recognise that various therapeutic agents have direct or indirect effects. They are "immune to the unfortunate dichotomy of 'body and mind,' and also to its only slightly less unfortunate substitute 'psychosomatic medicine'." They see living as a sustained adventure, and comprehensive medicine as an ancillary to that adventure—"dynamic, progressive and anticipatory."

This all sounds agreeable enough, if not particularly revolutionary. Any patient fond of a chat would welcome a doctor in his comprehensive mood; but those feeling really ill would perhaps be inclined to ask, "Yes, but where does it get me?" And here Dr. Galdston has something practical to suggest. The uppermost concern of comprehensive medicine, he says, is "What can best be done with what we have?" And "what we have" includes social services, reablement, re-education, convalescent care—and no doubt (though he does not say so) curative agencies. But besides using all these (which are, after all, the common tools of the ordinary less-than-comprehensive doctor) the comprehensive physician will look beyond his patient's current ills to his adventure, and prepare him to meet it. He will recognise that few young people are prepared for adult life, few married people for parenthood, and few of any kind for growing old. The physician can help to fit him, by instruction, to face these hazards. Modern science, Dr. Galdston suggests, has in a large measure exchanged mortality for morbidity; and modern medicine falls short of its goal, which should be "the promotion of robust and enthusiastic living, physically, emotionally, socially and in other ways too." His lecture is a warning against the other kind of comprehensive medicine—the social kind, which we are trying. "The basic and essential problem," he says, "is not 'who pays' but what kind of medical service will be rendered. If it be in the order of curative medicine, it is hopeless and can only lead to economic and professional bankruptcy." Without pausing to argue this out, we may just note that, unless sick people have the chance of being treated, comprehensive medicine becomes incomprehensible; and that comprehensive medicine in our sense can—and should—comprehend Dr. Galdston's kind.

1. *Med. Annals, Dist. Columbia*, 1949, 18, 59.

HEALTH CONGRESS AT BRIGHTON

OVER 1800 delegates attended the Royal Sanitary Institute's health congress held at Brighton from May 23 to 27, and 28 overseas countries were represented. The subjects discussed included the development of the medical services under the new Act; the care of children under the Children Act, 1948, and in nurseries; the training of health visitors; housing; hygiene in industry; the care and preservation of fish as food; and public-health research. Their wide scope illustrated the wide range of community services which are involved in maintaining the health of modern society. This congress brings together not only doctor and layman but also the members of a variety of other professions whose work has a bearing on health. Some of the advantages which might accrue are unfortunately lost by the overlapping of meetings, and this is a strong argument for holding sessions in the afternoons as well as in the mornings in future.

In his presidential address to the preventive medicine section Prof. Andrew Topping criticised the National Health Service for having its emphasis on curative medicine, with prevention "very much the poor hanger-on"; the Minister, in his view, should show his appreciation of the value of preventive services by making the financial rewards comparable with those of the curative branches. Sir Allen Daley said the new machine had begun to work with much less friction than many expected, largely because of the abundant good will displayed by all concerned. It must be remembered, though, that the three pillars of the service are all parts of the same structure—for example, a new housing estate affects the number of hospital beds needed in the locality—and there must be free trade in information at the earliest stages of any new project.

CONVALESCENT HOMES AND THE KING'S FUND

"CONVALESCENT homes offer one of the clearest opportunities for voluntary service still remaining." In his preface to the new issue of the King Edward's Hospital Fund *Directory of Convalescent Homes* [1] Sir Henry Tidy explains how the visits made by the Fund's representatives to collect data for the directory revealed a widespread lack of funds, aggravated by a tendency to isolationism. He has already detailed [2] the help which the Fund has provided towards remedying this state of affairs. Many of the homes outside the National Health Service now receive grants from the Fund, but even more important has been the encouragement given them to "look upon themselves with a critical eye, and to plan active steps which will make good any defects that this scrutiny may reveal."

MEDICAL RESEARCH COUNCIL

THE Medical Research Council have appointed Prof. Harold Percival Himsworth to be their secretary from Oct. 1, on the retirement of Sir Edward Mellanby, F.R.S. Dr. Himsworth is at present professor of medicine in the University of London and director of the medical unit at University College Hospital: he has been a member of the council since February, 1948.

1. The directory, obtainable from King Edward's Hospital Fund for London, 10, Old Jewry, London, E.C.2, price 5*s*., covers homes receiving patients from the four metropolitan regions.
2. Tidy, H. *Lancet*, April 2, p. 577.

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Special Articles

EPIDEMIOLOGY OF POLIOMYELITIS

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DEPUTY MEDICAL OFFICER OF HEALTH, CORNWALL

DURING the 1947–48 epidemic of poliomyelitis an investigation was undertaken in Cornwall in the hope of throwing light on individual susceptibility to infection and on the vehicle by which the virus is spread.

Between July 1, 1947, and Jan. 31, 1948, there were 40 cases distributed as follows:

(1)	North Tamerton outbreak	4 cases
(2)	St. Austell and mid-Cornwall outbreak	23 ,,
(3)	Cornish cases showing no connexion with either of the above outbreaks	6 ,,
(4)	Cases developing symptoms in Cornwall but infection contracted outside the county	7 ,,

Only outbreaks 1 and 2 are considered here.

NORTH TAMERTON OUTBREAK

North Tamerton, a village with a population of 191, is relatively isolated, the nearest towns being Launceston (14 miles) and Holsworthy (6 miles). In mid-July, 1947, it was smitten by an infection known locally as 24-hour flu. There were at least 30 cases, but symptoms were slight—mild fever (90%), headache (80%), vomiting (75%), pain in limbs (15%), sore throat (20%), and diarrhœa (15%). Of the 30 patients 3 subsequently developed poliomyelitis.

The first cases of 24-hour flu occurred in Mr. A's family. Mr. A owns a small mixed farm and sells milk to the local school and most of the houses in the village. His family consists of his wife and four children (aged 10 years, 7 years, 1¼ years, and 3 months). On July 9 and again on July 12, Mr. A, his wife, and the two elder children visited Holsworthy fair. Except for ice-cream they took no food in the town. On July 15, the boy aged 10 years stayed in bed, complaining of severe headache and sore throat. He vomited twice and was very hot and shivering, but the symptoms subsided in 36 hours: the doctor was not called in. Next day the boy aged 7 years complained of the same symptoms and was in bed for a day. On July 25 the baby was feverish and looked so ill that Mrs. A called in the doctor. The baby was better in twenty-four hours, but had a relapse a week later, the symptoms being similar, but twitching was also noted.

A second Tamerton family to become infected with 24-hour flu consisted of Mr. B (farm labourer) and his wife, a boy aged 10 years, and two girls aged 8 and 2. On July 24 the boy contracted 24-hour flu, the symptoms being precisely as those noted in family A. The two girls were affected on July 26 and 27. On July 27 Mrs. B, the boy, and the elder girl went to Polzeath, taking a sandwich lunch, so that, apart from ice-cream and ginger beer, no food was bought at Polzeath. Next day Mrs. B had headache and anorexia but did not go to bed. Both mother and son subsequently developed paralytic poliomyelitis. No other occupant of the bus which went to Polzeath, and which contained ten children, developed poliomyelitis.

A third case of poliomyelitis occurred in North Tamerton: a boy aged 15, who had symptoms of 24-hour flu on July 21 and developed paralysis on Aug. 5. A fourth case probably associated with this outbreak was a boy aged 8 years who lived in Launceston. His family had been staying at Polzeath and had met the party from Tamerton on July 27, but only on the sands. The boy returned from Polzeath on July 30, developed (?) 24-hour flu on Aug. 8 and paralytic poliomyelitis on Aug. 14.

North Tamerton has its own village school, which is attended by 24 children. Of these, 14 had 24-hour flu between July 11 and July 31 (attack-rate 58%). Only 1 of these 14 developed paralytic poliomyelitis. All the children have free milk (A's milk) at school. The milk is not Accredited; both methylene-blue test and bacterial count were unsatisfactory. It is supplied in bulk to the school, the schoolmaster being instructed to pasteurise it before issue, but it is doubtful whether the milk has been treated for some considerable time. The school water-supply, like all others in the area, is from a shallow well. Bacteriological examination of the water showed it to be heavily contaminated with excremental micro-organisms.

I made my first visit to North Tamerton on Aug. 3, 1947. The evidence, though inconclusive, pointed to Mr. A's milk as the probable vehicle of dissemination of the 24-hour flu if not the poliomyelitis. I therefore advised the district medical officer of health that all supplies of A's milk and of water should be boiled before consumption. This advice was circulated by poster and from the pulpit. No further cases of 24-hour flu occurred.

A survey was made of North Tamerton to ascertain the number of people in each household, the number of cases of 24-hour flu which had occurred, and the milk-supply of each household. The results were as follows:

A's Milk		
(1)	Domestic supply:	
	No. of houses supplied	12
	No. of houses in which cases occurred	8
	Percentage of households affected	66%
	Total population in houses	46
	Total no. of cases	16*
	Attack-rate	35%
(2)	School milk:	
	No. of children consuming	24
	No. of children affected	14
	Attack-rate	58%
Other Suppliers' Milk (two retailers)		
	No. of houses supplied	42
	No. of houses in which cases occurred	3
	Percentage of households affected	9%
	Total population in houses	145
	Total no. of cases	3†
	Attack-rate	2%

* Including 3 children who also had A's milk at school.
† Excluding 4 cases in school-children who were also receiving A's milk.

It will be noted that, though the milk-supply in North Tamerton was from three separate sources, all patients with 24-hour flu except 3 had consumed A's milk.

ST. AUSTELL AND MID-CORNWALL OUTBREAK

On Aug. 11, 1947, I was called to see case 5, a girl, aged 7 years, living at Trenoweth Mill, an isolated cluster of houses some four miles west of St. Austell. There was no doubt of the diagnosis, the girl having a flaccid paralysis of the lower limbs and some weakness of her spinal muscles. The main Great Western Railway track passes within fifty yards of the house, and the girl, in company with two children from next door, spent much of her time playing on the embankment (the attraction being minnows and bulrushes in the pond at the foot of the embankment), a point worth noting in view of Silverthorne's (1947) observation that the initial case in a small outbreak always occurs near railway tracks. Apart from attending the village school and Sunday school two miles away, the girl had not been away from home. Visitors from Middlesex had been staying in the house, and one of them, a girl of 11, had spent a day in bed on July 14 with gastro-intestinal symptoms.

Case 6, from the same area but a mile nearer St. Austell, was notified on Sept. 13. The patient, a woman of 26, lived with her parents and two younger sisters in an

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isolated bungalow, the nearest neighbour being half a mile away. She was employed as a conductress at the St. Austell bus depot and travelled daily to work by bicycle, taking lunch with her, but occasionally she bought pastries from café X in the town. Her interests were domestic, but she took an active part in the local chapel affairs, teaching at the Sunday school, which was attended by the patient from Trenoweth Mill (case 5), the last contact being 34 days previously.

No further cases were notified in September, but on Oct. 19, 32 days after the last-mentioned case, an outbreak occurred in St. Austell, 11 cases (nos. 7–17) being notified in the town or the immediate vicinity. From St. Austell the disease travelled eastwards. A case (included in the St. Austell series) occurred on Nov. 10, 1947, at St. Blazey, about three miles east of St. Austell; and a month later cases 18 and 19 were reported from Lostwithiel, seven miles to the east of St. Austell. One of these last two patients shared a bed with her twin sister, who had no symptoms suggesting abortive poliomyelitis. (The patient's blood-group was O, and her sister's AB.)

The season by now was well advanced. When the New Year arrived and passed without further cases, I felt fairly certain that the epidemic was at an end, but on Jan. 2, 1948, twenty-six days after the last notified case, a doctor in the south-eastern part of Cornwall notified an outbreak of poliomyelitis at Callington. In the first ten days of January, 5 cases (cases 20–24) were diagnosed in Callington and 3 more (cases 25–27) in the surrounding countryside. The proximity of Plymouth and the fact that 2 of the patients travelled daily to Plymouth Technical School made one search first in that city for the source of infection, but only 2 cases had been notified in Plymouth since Oct. 31, 1947, and those were in no way connected with the school.

An early case in Callington was in a boy aged 2 years. Living in the house was his maternal grandfather, aged 80, who was dying of cancer. The old man's second daughter lives at St. Austell, where her husband is employed at bakehouse X. She and her husband had visited Callington at most weekends in November and December and had spent Christmas with the boy and his mother.

A further patient in the Callington district is worthy of special note, an infant, aged 15 months, living in an isolated farm cottage on the edge of Bodmin Moor. For three months no member of the household had been away from home, and no friends or relations had visited them. The mother had twice been into Wadebridge to shop during the fortnight before Christmas, but for the most part she relied on delivery vans for her provisions. The country van from the X bakehouse called twice weekly. The child was fond of cream buns.

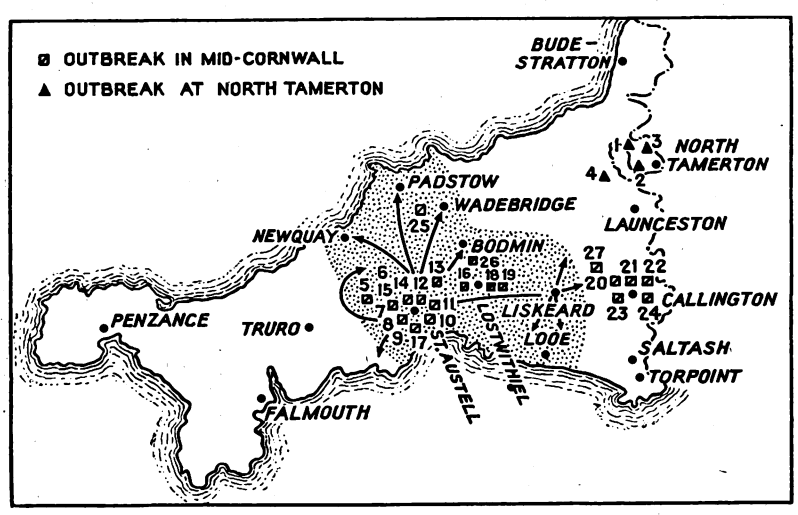

Fig. 1—Map of poliomyelitis cases in Cornwall from July 1, 1947, to Jan. 31, 1948. Case numbers same as in fig. 2.

INVESTIGATIONS

An analysis of so few cases can have little significance, yet is worth recording in that figures from a small circumscribed area tend to be more accurate than those of a larger less well-defined district. The figures for all the cases of poliomyelitis in Cornwall between Aug. 1, 1947, and Jan. 31, 1948, are as follows:

Incidence per 1000 population per annum	0·2	Sanitation: W.C.	60%
		Earth closet	40%
Incidence in urban areas per 1000 population per annum	0·13	Water-supply: Mains	66%
		Other sources	34%
Incidence in rural areas per 1000 population per annum	0·28	Milk-supply: Raw	63%
		Pasteurised	37%
Age-groups:		Persons per room:	
0–4 years	34%	Less than 1	34%
5–15 years	34%	1–1½	57%
15 or more years	31%	1½–2	6%
		More than 2	3%
Sex distribution:			
Male	48%		
Female	52%		
Direct contact established	7·5%		
Incidence where room shared	63%	Infection in room mate	Nil *
Incidence where bed shared	22·5%	Infection in bed mate	Nil

* Although no overt case occurred in room mates, two developed symptoms suggesting abortive poliomyelitis.

The standards of sanitation, housing, milk-supply and water-supply, though bad, correspond closely to the general standards in the area under investigation.

The possibility of the spread of poliomyelitis virus by milk or ice-cream was studied, but, except for North Tamerton, results were negative.

In the St. Austell outbreak the name of bakehouse X appeared more often than chance would dictate: workers from the bakehouse resided in three of the houses where poliomyelitis occurred; the first 4 cases in this town occurred in houses situated close to the bakery; and of the 9 early cases in the area 8 patients had eaten cakes from bakehouse X.

I visited the bakehouse and found it to be housed in somewhat old and unsuitable buildings, though the equipment was modern and the premises were spotlessly clean. The business was extensive, the firm owning a café in St. Austell and three subidiary cafés in neighbouring towns, together with a fleet of delivery vans supplying the intervening villages and hamlets. Fig. 1 shows how closely the area served by the bakery corresponded to the distribution of cases of poliomyelitis. The bakehouse is the largest in the centre of Cornwall but has by no means a monopoly, each of the smaller towns having one or two cafés, and the Coöperative Society a large bakehouse outside St. Austell with a van service which covers much the same area as bakehouse X. Two Plymouth firms cover the villages in the east of the area. Except for Callington, all cases occurred in the supply area of bakehouse X. It will be remembered that a worker from the bakehouse was a frequent visitor to the house of one of the Callington patients. The bakehouse was operated in two sections—the bread department, which worked only by night and employed ten men; and the confectionery department, in which three men and six women worked by day.

The distribution of the poliomyelitis cases corresponded so closely to the areas

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served by the bakehouse that some connexion between the two appeared likely. The cream decorations of fancy cakes and the fillings in sponge-cakes were a possible mode of spread, one of the ingredients of the filling carrying the virus, or the mixture becoming infected in the course of preparation by a carrier of poliomyelitis. Ingredients used were as follows:

Marsh-mallow filling	Standard Yeast Co.
Meringue filling	Standard Yeast Co.
Butter-cream	—
Dried milk	English and American
Dried egg	American
Dried egg	Canadian
Frozen egg	South American
Frozen egg	Australian

Contamination of the confectionery was possible by the pastrycooks, the van-man, and those employed at the cafés. On inquiry from Dr. F. O. MacCallum at the Virus Reference Laboratory I found that there were not enough laboratory animals for testing the various ingredients for virus or for its isolation from the stools of those employed in preparation and distribution of the food. Blood-serum was taken from the staff employed in producing and packing the cream confectionery and forwarded for serum-neutralisation tests.

A definite and remarkably regular interval of 26–35 days between groups of cases in mid-Cornwall was noted. This point is illustrated in fig. 2; the case numbers in this diagram are the same as those shown in fig. 1.

A note was made of pets or poultry kept where poliomyelitis had occurred, but the results were not significant.

The county poultry officer kept a careful watch for any paralysis in poultry, but throughout 1947 he

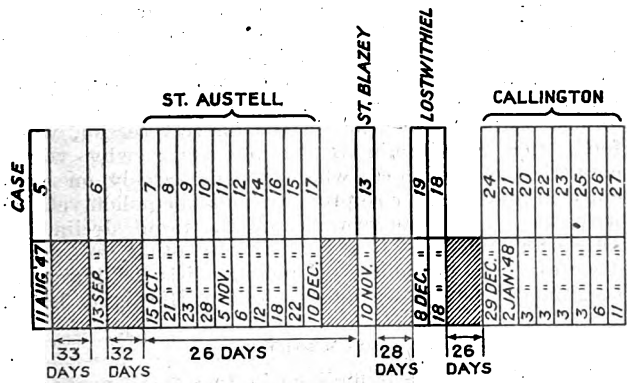

Fig. 2—Time intervals between groups of cases of poliomyelitis in mid-Cornwall. Case numbers same as in fig. 1.

saw only two cases of fowl paralysis, and those were in no way associated with poliomyelitis in man.

In the late summer and early autumn of 1947 a peculiar type of paralysis in dogs was reported from several parts of the county. The condition was particularly prevalent in the Falmouth area, where it became known as "American distemper" owing to the belief that dogs smuggled ashore by American seamen from tankers in the port were responsible for the outbreak. A veterinary surgeon in Falmouth informed me that between August, 1947, and the end of the year he had seen about two dogs a week with the complaint, most of which he had had to destroy.

I saw the disease myself when, towards the end of February, 1948, I was asked to see a spaniel aged 6 months. Two days earlier the owner had noted that the dog was dragging its right hind leg. The dog had a flaccid paralysis of both hind legs, seemed to be in no pain, was eating well, and had a normal temperature. The paralysis rapidly spread to invade the lumbar sector of the spinal cord with loss of sphincter control, and eight days after the onset of symptoms the dog had to be put down. The brain and spinal cord were extracted and sent to the Wellcome Physiological Research Laboratories for examination, who reported as follows:

"Mild patchy damage to cortical nerve-cells. Few loose cuffs of histiocytes, lymphocytes, and plasma cells round vessels at periphery of sections of brain stem; one area of such cuffing in mid-brain lateral to inferior colliculus of one side is also infiltrated with glia and histiocytes and is demyelinated. A few uncuffed vessels in the area have thickened walls. There is a similar area on the torn edge of the section of cerebellum. Purkinje cells appear normal. Cord, two sections decomposed, but otherwise normal. Diagnosis: group II encephalitis."

DISCUSSION

Direct contact has long been considered essential for the transmission of the virus of poliomyelitis, and is regarded by many as the most likely mode of infection (Sweetnam 1948). Yet in recorded epidemics the proportion of cases in which direct contact has been established, or secondary cases occurred among bed or room mates, is remarkably low, a finding not in agreement with parallel figures for proved contact diseases such as pulmonary tuberculosis and scarlet fever.

It seems scarcely probable that a disease which reaches its peak in August and September, the season when schools are closed and the people spend considerable time in the open air, should be spread by droplet infection. It seems even less probable when we consider the unfailing diminution of poliomyelitis with the advent of colder weather, indoor amusements, and the onset of coughs, colds, and other respiratory ailments.

The seasonal peak of poliomyelitis has been shown to be remarkably regular. Bertenius (1947), analysing the monthly incidence of poliomyelitis, typhoid and paratyphoid fevers, dysentery, and gastro-enteritis for the years 1911–40 in Sweden, found that in the typhoid-paratyphoid group and in dysentery, though the monthly incidence was usually highest during late summer, there were many exceptions to this rule. Acute gastro-enteritis, on the other hand, showed its highest incidence in the third quarter in every year but one, and in poliomyelitis the highest incidence was in August, September, and October, without any exception at all.

The epidemiology of the typhoid-paratyphoid-dysentery group differs much from that of the gastro-enteritis group, the former relying for its spread on chronic carriers, who are few but whose activity continues for a considerable length of time. Consequently, though food and water are liable to become contaminated by such a carrier at any season of the year, epidemics are more likely in warm weather, when there is more chance of the bacteria surviving outside the body, and flies are more numerous. The spread of gastro-enteritis is also largely by carriers, but their number is probably very great and the length of time they remain dangerous comparatively short. The spread of poliomyelitis and that of gastro-enteritis seem to bear a very close resemblance; their seasonal epidemic curves are similar, and their causal organisms are widely dispersed among contacts, who, however, harbour them for only a comparatively short time—possibly a month.

The weather has some influence on the incidence of poliomyelitis, as is shown by a review of the disease in Cornwall for the years 1911–47 inclusive. Five epidemic years occurred during this period—namely, 1911, 1919, 1921, 1945, and 1947. These five epidemic years include the three hottest summers (1911, 1921, and 1947), and in the two other epidemic years (1919 and 1945) the mean average temperature for August was 2°F above the average.

The shortage of laboratory animals makes the investigation of outbreaks of poliomyelitis extremely difficult, but in the mid-Cornwall epidemic circumstantial evidence strongly suggests spread by contaminated artificial cream used for filling pastries. If future epidemics of poliomyelitis are studied, not with a view to establishing

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direct contact between cases but with a determination to study in detail the source and possible contamination of food, further light would, I believe, soon be thrown on the mode of dissemination of the virus.

There can be little doubt that the outbreak of 24-hour flu at North Tamerton was spread by milk; 3 of these patients subsequently developed paralytic poliomyelitis. At the time I thought that the 24-hour flu was abortive poliomyelitis, but careful investigation of the later outbreak of poliomyelitis in mid-Cornwall did not elicit a similar high incidence of abortive cases. I am therefore forced to conclude that the 24-hour flu at North Tamerton was a gastro-intestinal infection, probably viral in origin, since no pathogens were isolated from the stools, and that its association with the outbreak of poliomyelitis was accidental.

The susceptibility of the individual to infection is a fascinating problem, to which there is as yet no satisfactory explanation. In the 27 cases described here, no fewer than 8 patients shared a bed with another person, and in the remaining 19 cases, 11 patients shared a room. Yet none of these close contacts developed poliomyelitis. A possible explanation is that the virus alone cannot produce paralysis, but needs a second factor, which may be physiological, a trace element, a poison, or nutritional.

PHYSIOLOGICAL FACTOR

Many theories have been put forward to explain the peculiar sporadic distribution of poliomyelitis on the basis of physiological make-up of the individual. The patient's blood-group has been considered by some to influence his susceptibility to infection, group B being abnormally resistant and group O relatively susceptible (Jungeblut et al. 1947), but Madsen et al. (1936), in an analysis of 1118 cases in Denmark in 1934, could find no statistical evidence in support of such a theory. Some 25 of the Cornish patients were grouped, the results showing a relatively high proportion of group O (60%) and relatively low proportion of groups A (25%) and B (5%). Draper (1935) and Aycock (1937) have suggested that the endocrine make-up of the individual, particularly in relation to the secretion of the pituitary and sex glands, plays a part, and some confirmation is afforded for this view by Curley and Aycock (1946), who have shown that castrated monkeys under treatment with stilbœstrol showed increased resistance to the intranasal instillation of poliomyelitis virus but no resistance to subsequent intracerebral inoculation. Possibly, under such drastic experimental conditions, the nasal secretions would be so altered as no longer to afford a suitable nidus for the lodgment of the virus.

Another physiological factor to be considered is gastric acidity. Poliomyelitis virus, though highly resistant to many physical conditions, is comparatively susceptible to acid. Faber and Dong (1946) have shown that, with the usual pH in the stomach when only gastric juice is present, and at the height of digestion of a mixed meal, the virus is rapidly inactivated. Since the acidity of the gastric juices varies from person to person, the possibility of the virus reaching the duodenum in an active form must vary with the individual. Here at least is a possible explanation of individual susceptibility.

Trace Elements

Extremely small quantities of certain elements, chiefly metals, are needed for the health of animals and plants. At least eleven such elements are at present recognised, and of these copper is the only one known to be essential for plants, animals, and man (Brockington 1944). Deficiency or lack of copper in grazing animals leads to demyelination of the cerebellar tracts, with resulting ataxia (swayback of Derbyshire and enzoötic ataxia of Australia), whereas in man it is associated with anæmia. Should trace elements play a part in determining individual susceptibility, one would expect the disease to be endemic in certain tracts of country. The plotting on a map of the exact location of all cases of poliomyelitis in Cornwall in 1911–47 lent no support to this theory.

POISONS

Scobie (1946) has suggested that poliomyelitis is due in part to a toxic substance in the food, in that a histotoxic poison in the food influences the susceptibility of the nervous tissue and allows the virus to penetrate. He suggests that hydrocyanic acid is such a poison and maintains that it will produce, in a laboratory animal, symptoms and lesions similar to those of poliomyelitis. He points out that this acid is present in many vegetables and fruits, especially in the harvest season, when poliomyelitis is most frequent. Drought increases the concentration of hydrocyanic acid in plants, and the acid is also stated to be more prevalent in the northern States of the U.S.A. than in the southern.

NUTRITIONAL FACTOR

Recent experiments of American workers (Foster et al. 1944, Rasmussen et al. 1944, Lichstein et al. 1946) have shown that, so far as lower animals are concerned, susceptibility to paralytic poliomyelitis is in some way linked with excess or deficiency of the vitamin-B complex. Adequacy of certain elements of the complex allows the virus to gain access to the nervous system, whereas relative lack of the vitamin affords some protection. How far these observations are applicable to man remains to be seen; but, if vitamin-B complex is essential for the invasion of the nervous system by the poliomyelitis virus, many epidemiological problems would be solved. We should then know why the virus picks out the healthy and strong, and why epidemics occur almost without exception in the harvest season, when foods rich in vitamin B are plentiful; why young countries and colonies, which depend largely on agricultural products, are so prone to epidemic poliomyelitis; why the disease underwent such a rapid decline in 1914–18; and why, in contrast to other infectious diseases, the incidence of poliomyelitis is lower in illegitimate than in legitimate children (Bertenius 1947).

SUMMARY

The epidemiological findings in two small outbreaks of poliomyelitis in Cornwall during 1947–48 are described.

The first outbreak, in which 4 cases of paralytic poliomyelitis developed in an isolated village, was associated with an outbreak of a mild milk-borne gastro-intestinal infection described as 24-hour flu. It was thought at the time that these cases of 24-hour flu were abortive poliomyelitis, but a similar high proportion of abortive cases was not found among cases in other parts of the county.

The second and much more extensive outbreak, in which 23 cases were notified, occurred in central and east Cornwall. The mode of spread was not discovered, but the spread was very closely associated with a particular bakehouse. Two further points of interest in this epidemic were noted—namely, the absence of infection in room mates or in close contacts, and the consistent time-lag of 26–35 days between groups of cases.

The mode of spread of poliomyelitis and the susceptibility of the individual to infection are discussed.

I wish to thank Dr. R. N. Curnow for permission to carry out these investigations; Dr. F. O. MacCallum for much helpful advice and for undertaking the examination of virus specimens; and Dr. F. D. M. Hocking for carrying out numerous pathological investigations.

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GENERAL MEDICAL COUNCIL

SESSION MAY 24–27

Sir Sydney Smith was re-elected chairman of business.

Disciplinary Cases

Frederic Syson, registered as of 52, Station Road, Horsforth, Leeds, M.B. Glasg. (1925), appeared for judgment postponed from last November. He said that since 1945 he had not touched alcohol or alkaloids. The council postponed judgment for one year.

In June, 1947, the council postponed judgment on *Chandra Shekhar Jagannath Dan De Kar*, registered as of 24, Marden Road South, Whitley Bay, Northumberland, L.M.S.S.A. Lond. (1935), on convictions found proved against him of failing to make certain entries of drugs in the Register. Dr. Kar was represented by Mr. Norman Black. The council did not direct the registrar to erase his name from the Medical Register.

Mr. Black then referred to an undertaking given on his client's behalf at the last hearing, in respect of other matters then considered, not to perform certain surgical operations on his premises and without the presence of any other person qualified or registered under the Medical Acts. Counsel asked to amend the undertaking by inserting after "premises" the words "unless registered as a nursing-home." The President said that if he wished to proffer that undertaking, they would accept it, but they did not ask for any undertaking and did not wish to reopen matters closed two years ago. The undertaking was given.

John Matthew Campbell, registered as of Dromore, Omagh, co. Tyrone, M.B. N.U.I. (1942), against whom judgment was last May postponed for one year, was not present and the case was postponed until the next session.

The council did not direct the registrar to remove from the Register the names of the practitioners in the following cases where judgment had been postponed: *Trevor Owen Williams*, registered as of 7, Calder Drive, Liverpool 18, M.B. Lpool (1913); *James Kirkness*, registered as of 5, Warrender Park Crescent, Edinburgh 9, L.R.C.P.E. (1925); *Basil Elliott*, registered as of 106, St. George's Terrace, Newcastle-on-Tyne 2, L.M.S.S.A. (1928); *James Scott*, registered as of 68–69, Guilford Street, Russell Square, London, W.C.1, M.B. N.U.I. (1926); and *James Anderson Edward*, registered as of 179, Elm Grove, Southsea, Hants, M.R.C.S. (1929).

Malcolm Andrew Graham-Yooll, O.B.E., registered as of Elm Tree House, Pembroke, M.B. Edin. (1923), produced testimonials as to his behaviour, with special reference to his position under the Dangerous Drugs Acts and Regulations. The council were satisfied with his conduct.

A medical certificate was received stating that *William Allan*, registered as of 31, Hill Crest, Burnley Road, Sowerby Bridge, Yorkshire, M.B. Glasg. (1926), was unfit to attend for postponed judgment, and the case was adjourned.

Francis Murray, registered as of 417, Evelyn Street, London, S.E.8, M.R.C.S. (1930), against whom judgment was last November postponed for six months, appeared and was represented by Mr. Norman Richards, instructed on behalf of the Medical Protection Society. The council postponed judgment for a further twelve months.

The council postponed consideration of the case of *Joseph Kevin Conlan*, registered as of 81, Stubbington Avenue, North End, Portsmouth, M.B. Durh. (1940).

NAME REMOVED

Ralph Martin Case, registered as of 71, Gillott Road, Edgbaston, Birmingham, M.B. Birm. (1934), appeared for postponed judgment on two charges, and in respect of a further charge of having been convicted of two infringements of the Dangerous Drugs Regulations, 1937. He was represented by Mr. N. Leigh Taylor.

Dr. Case said that he started to take morphine in 1940, when he had a great deal of extra work and suffered from insomnia. After he found he had become an addict he sought treatment. His relapse to drugs occurred soon after he learnt that a grant, which he had been expecting, could not be given, and his prospects of remarriage seemed in consequence to be remote. He had since been under continuous treatment and had not attempted to sign any prescriptions. Dr. G. Franklin said that Dr. Case was coöperating fully in treatment. The prognosis was good; the treatment should take about three years, but in a shorter period Dr. Case might be able to undertake professional work. Mr. Taylor said the fact that Dr. Case had gone through withdrawal of the drug on five occasions spoke for his courage and underlined his personal tragedy that not until seven years after the addiction arose did he receive proper treatment.

The council directed the registrar to remove Dr. Case's name from the Register. The President added that they thought it on the whole a kindness to him to remove his name for the time being, but if he came before them cured of his addiction his application for restoration would be sympathetically considered.

ALLEGED CANVASSING

Michael Ansel Wiseman, registered as of 3, Oakfield Road, Didsbury, Manchester, M.R.C.S. (1925), appeared on a number of charges of alleged canvassing of patients and one charge of alleged advertising for the purpose of obtaining patients or promoting his own professional advantage "by causing to be exhibited on an interior wall opposite the counter in the Baguley Post Office a notice directing attention to your professional qualifications and services, and stating that messages might be left for you at the said Post Office."

This was the first case of alleged canvassing under the National Health Service to be heard by the council. The complainants were the Medical Defence Union, whose case was presented by Mr. Taylor, instructed on behalf of the union by Messrs. Hempsons. Dr. Wiseman was represented by Mr. Norman Richards, instructed on behalf of the Medical Protection Society by Messrs. Le Brasseur and Oakley. At the outset, Mr. Taylor announced that he was offering no evidence in respect of six counts of alleged canvassing.

Mr. George Parry stated that Dr. Wiseman said to him: "I am the new doctor in the district. If you wish to change your doctor you can do so now: hand me your card." Dr. Wiseman took the cards of Mr. Parry and six of his relations. Mr. Parry agreed that a statement which he had signed, saying "I changed over from Dr. Pearce's panel to Dr. Wiseman's panel of my own accord because Dr. Wiseman's surgery is closer," was correct.

Mrs. F. M. Thompson said that Dr. Wiseman called and told her: "I am your new doctor." She said her doctor was Dr. Pearce. She gave Dr. Wiseman the cards because in her ignorance she thought that, being in a new house, she had to have the nearest doctor. She did not want to change. Mr. Edgar Thompson said that Dr. Wiseman told him: "I am a good doctor. I lance abscesses and boils, and I don't send people to hospital." Dr. Wiseman wanted him to get Mrs. Thompson to sign a statement, but he would not let her. He had never been asked by Dr. Wiseman to go on his list.

Mrs. S. M. Winters said that she had not asked Dr. Wiseman to call and had never seen him before. He said: "I am the new doctor for the estate; can I have your cards?" She told him she already had a doctor but he lived on another estate. "Dr. Wiseman said he lived nearer and it would be better if we had him. I gave him my card and baby's card." Dr. Wiseman came again and asked her to sign a statement that all she had said to Dr. Pearce was lies. She replied that she could not be on both sides. Dr. Pearce came to see her soon after Dr. Wiseman's first visit. He wrote down what she said and asked her to sign it.

DR. HARGREAVES: REFERENCES

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Dr. R. M. Pearce, of Brooklyn, Altrincham Road, Wythenshawe, Manchester, said that he lived close to the Baguley Estate. He had practised in this neighbourhood for fifteen years. In the sub-post-office near the estate he saw a card hanging behind the serving counter, which said: "Messages may be left here for Dr. Wiseman," and giving the address and surgery hours. The notice was exhibited from about Jan. 11 to Feb. 2.

Mr. Taylor then read statutory declarations in support of charges by five people.

Dr. Wiseman denied the charges. He said that a neighbour whose baby he was attending told him that Mr. and Mrs. Thompson wished to register with him and asked him to go and see them. He met Mr. Parry when coming out from another patient's house. Mr. Parry said to him: "Good morning, doctor. How is the little boy getting on?" Mr. Parry asked him to come in and suggested registering with him. Mr. Parry did register with Dr. Wiseman, who treated him. Dr. Wiseman also denied the accusations in the other cases. He did not know that the notice in the post-office was there until a complaint from Dr. Pearce was transmitted to him. He did not put it up or ask the postmaster to put it up, and immediately he knew about it he asked for it to be taken down. It contained no address or surgery hours.

In cross-examination, Dr. Wiseman denied he said: "I am the new doctor" or "I am the doctor for the estate." What he said was: "I am a doctor on the estate."

Dr. Pearce, recalled, said that he took steps only after about forty of his patients had told him Dr. Wiseman was canvassing.

The council found that Dr. Wiseman had canvassed patients and ruled that he had been guilty of infamous conduct in a professional respect within the meaning of section 29 of the Medical Act, 1858, and paragraph 6 of the warning notice issued by the council, and ordered the registrar to erase his name from the Register.

CHARGES OF DRUNKENNESS

Graham George Robertson, registered as of 25, Mariners Lane, Tynemouth, M.B. Edin. (1934), was charged with having been convicted at Tynemouth on Jan. 3, 1949, of driving a motor-car while under the influence of drink.

Mr. F. P. Winterbotham said that Dr. Robertson had been found guilty of drunkenness whilst on active service by court-martial in September, 1943, and in October, 1943, had been convicted in a civil court of driving under the influence of drink. In May, 1944, judgment against him was postponed for one year by the council; in November 1946, his name was erased from the Register. It was restored two years later.

The council found the conviction proved, "but in spite of that temporary lapse the council has decided neither to postpone judgment nor to order the registrar to erase your name from the Register."

Norman Fraser Stocks, registered of 4, Priestfield Road, Edinburgh 9, M.B. Edin. (1935), was charged with having been convicted in 1936 of attempting to drive a motor-car and of driving a motor-car while under the influence of drink, and in October and December, 1948, of being in charge whilst under the influence of drink. Dr. Stocks gave evidence and was represented by Mr. A. W. Standing. The council found the convictions proved and postponed judgment for one year.

Other Business

At the final sitting the report of the public-health committee, presented by Sir Andrew Davidson, led to a discussion on courses for the D.P.H. Sir Leonard Parsons pointed to the large number of separate courses with a relatively small number of entrants. Sir Sydney Smith thought it might be increasingly difficult to attract recruits to the public-health service, with the larger rewards now obtainable in other fields. Prof. R. M. F. Picken, while agreeing that it was unsound economically to run a large number of courses for relatively small numbers of students, believed it would be unwise at the moment to ask universities to cut down their courses or to attempt to combine the courses of different universities; he had found it very hard to divert students to other centres. The President laid stress on the fact that the licensing bodies were independent: the Medical Act, 1886, provided that they might combine, but the council had no power to force them to do so. Such combination was certainly desirable, because a number of licensing bodies had only a small number of students and granted a small number of diplomas. But the council could not interfere.

Sir Cecil Wakeley was appointed one of the two treasurers of the Council, in the room of the late Dr. Bone. Sir Henry Cohen, Prof. R. J. Brocklehurst, and Sir Andrew Davidson were appointed, respectively, chairmen of the education, examination, and public-health committees. Professor Brocklehurst, Sir Sydney Smith, and Mr. R. A. Stoney were appointed representatives of the branch councils for England, Scotland, and Ireland, respectively, on the Dental Board of the United Kingdom for five years from July 28 next.

MR. HEMPSON'S RETIREMENT

During the session the President observed that this was the last occasion on which Mr. O. Hempson would attend before the council. During these last thirty years he had been continuously presenting cases either in his private capacity or on behalf of other bodies. For the council the President expressed appreciation of the valuable services rendered by Mr. Hempson in his lucid presentation of the facts and his skilful and intelligent advocacy.

Public Health

Food-poisoning

DURING the last fifteen years there have been two notable changes in official arrangements for the investigation and control of food-poisoning: (1) cases have become notifiable under section 17 of the Food and Drugs Act, 1938, and (2) the Public Health Laboratory Service has been set up.

The Ministry's pamphlet on the action to be taken by medical officers of health in investigating food-poisoning was first issued in 1935; and it has now been revised in the light of these changes.[1]

Under section 17 of the 1938 Act, when a medical practitioner has a patient who has, or who is suspected of having, food-poisoning, his duty is to inform the medical officer of health for the district; and under the National Health Service Act of 1946, where the local authority is not the local health authority the district medical officer of health must send a copy of the doctor's certificate within twelve hours to the local health authority. The Minister has decided that notifications under section 17 of the Act of 1938 need not include cases in which food causes an infectious disease which is otherwise statutorily notifiable.

The Registrar-General has asked medical officers of health to include notified cases of food-poisoning in their weekly returns; and from the beginning of this year these returns have been included in the Registrar-General's weekly reports. "The publication of these figures," the pamphlet observes, "may help to bring to light hitherto unrecognised factors in the causation of food-borne disease."

The pamphlet also discusses the investigation of notified cases and the collection of data; appendices deal with inquiry into outbreaks, the clinical features of the illness associated with various agents and differential diagnosis, field and laboratory investigation, and returns of notifications and outbreaks.

Accommodation for Mental Defectives

The shortage of hospital accommodation for mentally defective patients is a national problem, as recent parliamentary questions have shown. In a survey of their area the North-East Metropolitan regional hospital board have found that over 400 low-grade defectives are waiting for admission to institutions. Those at the bottom of the list cannot expect to be admitted in less than 8–10 years. The mental-health committee are recommending the board to secure sanction from the Minister of Health to proceed immediately with the erection of temporary accommodation for at least 200 patients. This plan is in addition to the long-term project which is already in hand for permanent accommodation.

1. Ministry of Health. Food Poisoning: Steps to be Taken in England and Wales by Medical Officers of Health in the Investigation of Food Poisoning. H.M. Stationery Office. Pp. 10. 3d.

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Disabilities

31. HOSPITALISATION IN CHILDHOOD

A SEVERE knee injury at the age of six brought me to an orthopædic institution some hundreds of miles away from home. Unfortunately, a dormant tuberculous infection of the joint had flared up as a result of the injury, and sunlight treatment for surgical tuberculosis had not then been thought of. My leg was encased in plaster-of-paris and I was left at the hospital, where I stayed for just over three years. The desperate homesickness and misery of the early weeks gave way to indifference and boredom during the subsequent months; but eventually I achieved the comfortable position of the hospital's oldest inhabitant, liked and respected as such. It was a small private institution, and not a difficult conquest for the boundless vitality of a child, once that vitality was freed from earlier bondage.

Looking back on this experience from a distance of forty-odd years it is surprising how serene my memories of it are compared with memories of the rest of my childhood. I endured many discomforts, and I lived in perpetual dread of the weekly aspirations of pus which were done through an opening in the plaster; but none of this seems to have left a mark, and I remember my mother's first and only visit far more vividly. It occurred many months after my admission and was evidently not voted a success, for it was not repeated. I can still feel the chill of disappointment at seeing her suddenly in the room, for I could think of absolutely nothing to say to her. The total inadequacy of my emotional response to her shocked me and gave a sense of unreality to our meeting which will haunt me through life. Contact with home had been out of the question at that distance, and the kind of letters that could be written to a child of six provided no link; besides, I was not able to reply to them for a long time, and they soon became a formality—on both sides, I suspect.

By the time I was able to correspond I had ceased to feel that I belonged to the people to whom I wrote, but I had also grown used to reserving my emotions when dealing with others. The word home had indeed acquired a distinctive meaning, but it had little in common with the haven of refuge which it spells for most people. To me, home had become a worry and a source of bewilderment; it concerned itself overtly with my physical welfare in which I had no interest, so I took to giving automatic reassurance about this without further thought. But it also seemed to demand something of me which I could not give, and this failure on my part lent a sense of insecurity to all my dealings with home which I have never lost. Even now, I can muster little sympathy for people who complain that they are so far away from home; I know what they mean by home, but I cannot feel the reality which this concept has for them.

I must have remained in this emotional vacuum for some time after becoming "hospitalised," and I cannot exactly remember when or how I emerged from it. Gradually my affections must have attached themselves to members of the hospital staff, for I remember being more and more closely drawn to the woman superintendent who was a particularly charming person. She eventually became my staunch friend and ally, and my unsatisfied hunger for love was appeased at last. Psychologists would say that I had found a mother-figure, and they would be right; warmth, security, affection—all that a mother usually provides—came my way from this friendship. It was largely thanks to the gentle handling of this charming woman that I succeeded in reconciling myself to a reality which seemed impossibly harsh and uncompromising to my immature eyes; it cut me off from every outlet for my physical energies, it gave practically no scope for self-expression (I was confined in a cubicle), and it promised no sort of future which a child of eight could accept as bearable. I knew that I should never be able to compete with my companions or join in the activities which are dear to children of that age; nor had I any possible substitute for these activities. Yet I made my peace with reality on its own terms, and it is clear that an equally potent reality which came to my aid on the credit side made this possible; it was the deep attachment to the person who had won my respect, who knew and understood me in all my moods, and whose rich personality made even a drab existence seem worth while. It comforted me very much to hear years later how fully my attachment had been reciprocated; my friend left the institution soon after I had gone, for her work there had become purely routine and somehow unsatisfying.

In forming this relationship with her I had compensated for the loss of home very successfully, but it is obvious that such a relationship must become a significant factor in one's life. It is not one which leaves much room for home and family in the affections, and I had in fact cut adrift from home completely through the success of my subsequent attachment. I discovered this on being uprooted a second time, and restored to my home again.

All my former insecurities assailed me, for I returned an alien; I held a passport indeed, but it had ceased to be valid long since. Within three years the community to which I should have belonged had become self-sufficient, and so had I in relation to it. A place had to be made for me, but I felt, and was, an intruder in it. Circumstances demanded a welcome for me and I received one which satisfied all outward appearances. How my family responded within I can never know, for such things were not allowed out into the open, even had they been formulated. I myself could make nothing lasting of the welcome, and I had no key to my difficulties. I know now that my emotions were hopelessly at fault, and that reason was helpless without them. The occasion was sufficiently momentous and dramatic to be emotionally exhausting, even had the emotions been appropriate; but when secret grief needs to be expressed in joyous reunion, only barrenness can result in the subsequent relationship.

In the end, this barrenness led me away from home again, for I rejected the false position which loneliness among friends had put me in; but no second mother-figure came my way, and indeed I was not then capable of creating stable relationships. I remained intensely responsive to affection, but far too vulnerable and unsure of myself to attract friends; my responses were exaggerated, often uncalled for, and I became extremely moody and depressed at the rebuffs which my own clumsiness had provoked. I also became aggressive, for the world seemed hostile and needed none of me. With so many raw edges, I became less and less venturesome in looking for intimacy, and casual contacts were denied me by my damaged knee and my grossly impaired mobility; this disqualified me from joining in group activities such as games, and drove me still further within myself.

* * *

Now a confirmed hermit crab, I returned home again just before the end of the 1914 war. The war had interrupted my schooling a second time, and home offered the best chance of catching up on work and achieving social effacement. I buried myself in books and studies as exaggeratedly as I had flung about for friendships before, but this time not without some result; I was beginning to find security through scholastic success. At the same time I had canalised some of my aggression by letting it drive me into competition with my fellows in the academic field; I felt that if I could do three times as well in an exam as anybody else, I should

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be even with my environment for the moment, and I should have dealt a blow to the hostile forces which seemed to be aligned against me.

On the whole, this was as good a solution as could be found, and I drove myself mercilessly in the pursuit of academic success; it alone could compensate for social failure, and I learned to justify that failure by adopting perfectionist principles and setting myself impossibly high scholastic standards. If beyond my own capacity, these also put me beyond the laws which governed my surroundings, and this too liberated aggression without harming anybody but myself.

I believe now that it was not such an unhealthy thing as it seemed to my family, for they only saw that my preoccupation and my tensions made me impossible to live with. I have no doubt that I was, and that the strain of so long a spell of unceasing work took its toll of my nervous system. But I had already stamped on the softer side of my nature in order to put myself on my feet, and I had lost so much ground socially that any efforts in that direction might have courted more failure and further disappointment. The academic ground on the other hand seemed safe and firm; failure might have been bitter, but success opened the only road which could lead me away from home to some concrete, if distant, goal. It did.

The goal was geographically at the very safe distance of several thousand miles, but it was chronologically not too remote. I had got thus far through my own efforts, and now good fortune stepped in and altered the course of my life. I am only able to record such disability as remained despite good fortune, for I have no idea where my own unaided steps would have led to. Luck brought me in contact with people of high intelligence and wide sympathies. They understood me better than I did, and they gave me time to discover myself and to establish my right to a place among them at my own pace and in my own way. A wholly successful marriage with a person of similar qualifications and equal understanding completed the emotional cure, so far as this could be done. I have yet to discover how far it can be done, for I am still progressing towards complete cure, and I progress by re-fighting the battles once lost by my emotions, now capable of being won by my intelligence.

* * *

If I had to describe my life in one sentence, I should say that it is one which has not known the blessings of tranquility, except in short snatches. I still have aggressions, and they still tend to trip me up when I am not looking. They take the unfortunate form of making me excessively intolerant to my own faults in other people, and are therefore a menace to my relationship with my own children. It is almost impossible to hide this intolerance successfully, and it is quite impossible to reason it away or argue oneself out of it. I have only recently learned to exercise the kind of watchfulness it needs, and to be ready for a fresh battle whenever intolerance rears its head. I am also resigned to continued battle, for victory is short-lived and must be won anew at every turn. It is a hand-to-mouth existence for my self-esteem, and, so far, not a particularly tranquil one; but each victory makes the next one a little more probable and a little more worth while. For a time, happiness and serenity must depend on the successful mastery of my own wayward and exaggerated emotions; the flood of light which intelligence has thrown on them first showed me that happiness could be brought within reach, and that I must fight for it myself. Such serenity as I have has been gained in conscious close combat between sound reason on the one hand and disorderly unsound emotion on the other. A solution to my particular problem, in the absence of a good intelligence, I am unable to imagine.

In England Now

A Running Commentary by Peripatetic Correspondents

THE skinny hand of Flurry Knox's grandmother "had the grubby tan that bespoke the professional gardener." She would have been at home at the Chelsea Flower Show, where many such hands were clutching catalogues, itching to finger mould, or hiding in unwanted urban gloves their horny nippers, the dread of insects throughout the Home Counties and beyond. Even Mrs. Knox's famous purple bonnet would not have sat ill on some of the venerable heads bending knowledgeably over rockeries or sniffing—sometimes disdainfully—at sweet peas. One or two had allowed a native eccentricity to influence their dress, but most of them were clad dowdily rather than oddly; they moved among the flowers like ancient dressers among chorus girls arrayed for the footlights. But here and there the scarlet of the Pensioners improved the look of the crowd.

As usual, the flowers were incredible. Roses bloomed as though they had timed themselves to the minute for the occasion, begonias mimicked roses on a monstrous scale, delphiniums towered overhead like lighthouses, orchids hung out their butterflies and spiders, sweet peas frothed over. A hungry generation, however, stood rapt before the vegetables—tomatoes raised on pinnacles, peas and carrots gathered up into the semblance of fir-trees, cucumbers as straight as candles, and strawberries dangling recklessly from the living plant. The earnest custodians don't look very strong; it would be easy enough to rush them. What a triumph of civilisation—or anyhow of conditioning—the whole thing is.

* * *

STAGE DOCTOR

The doctor on the stage does not,
Quite candidly, inspire a lot
Of confidence; his stethoscope
Informs him there is little hope,
And when he takes a pulse at speed
Muttering "Hum" and "Yes, indeed,"
And promptly sits or gravely stands,
His visage buried in his hands,
Resigned to snivel and relax work,
Resembling a dejected wax-work,
The anxious audience feels as one
That there is nothing to be done.
Yet, if the fellow proved to be
A fiend in human symmetry,
A villain of consummate class,
With plate and character of brass,
A Lakington, an Angelus—
This might create excitement plus,
For wicked doctors, as we know,
Can ring the bell and steal the show.
What of the future? Shall we find
A doctor of a different kind?
No longer fogged and ill at ease,
No longer trembling at the knees,
Nor basely splitting skulls and fees?
Will Bevan and his Whitehall chaps
Now stay the hand, arrest the lapse,
And clear the mind of cant and doubt;
The doctor may come in and out
A credit to this darkening age,
Filling prescriptions and the stage,
Competent, calm and rationalised,
A Perfect Doctor—nationalised.

* * *

In my part of England, at any rate, the N.H.S. is not working out too badly for the G.P. Winter is over, flu is on the wane, measles spots are fading, and the public, rejuvenated in its Spring outfit of new teeth and new glasses, is getting decidedly more thoughtful for our welfare. Apart from confinements I can count the night calls for the last two months on the fingers of one hand, and most of those were emergencies. Little Carol's unexplained temperature of 105° just before midnight would have alarmed any mother; a hæmatemesis of well over a pint at bedtime certainly called for a visit before morning; and the man with angina at 2 A.M. was very sorry to call me out. Sunday calls still come, but they are generally for something out of the ordinary.

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The actress with sudden pleurisy could hardly be blamed for begging for swift and immediate treatment in the vain hope that she might be fit to appear in the Monday matinée. And then there was the lady who rang at teatime to say that she had been trying since early morning to waken her sister; her box of sleeping tablets was empty and did the doctor think there could be anything wrong?

Yes, on the whole my patients are far more considerate now than they were under N.H.I. What woman of those days would have told her husband, when he was writhing in agony with renal colic, that he could have the doctor in the morning but she certainly wasn't going to get her out at three a.m. just for a stomach-ache? Again what mother would have sat up all night plying a case of acute appendix with brandy when the pain became worse and then sent round a polite little note in the morning for a visit "after surgery please"?

We hear a lot about the abusing of the service by its users. We hear less about those who use it in moderation and nothing of the hundreds on our lists who have hardly used it at all.

* * *

I've just been asked if I would let two of my four rooms! Isn't it pathetic? It makes me turn into a blazing red Tory—this lack of houses—and the bricklayers laying half a dozen bricks a day. But I think the doctors are to blame too. They are so proud to have pushed people beyond the Bible allowance of three-score years and ten; and of course in lots of ways that is an excellent thing, but it is simply awful in others. There are crowds of old people here; they wander in front of cars, they have strokes and heart attacks, but however bad they are they *don't die*. When they are ill the homeless young couples apply hopefully for the little cottages where the old people live, but the older they get the more strongly they seem to cling to life. They can't get anyone to look after them, and they are in a constant state of anxiety over their dwindling capital.

What we need is Homes in every village, so that the old people are not dragged away from all those they know. Some should pay and some should not, but all should be able to have their own furniture in their own room. There's a nice house here that would probably take a dozen, if it had someone to buy it. At present it houses only one old pair. Think of the houses, and the labour, that would be freed if the authorities would buy some big houses and convert them. If they were made into really attractive Homes the old dears would soon go to them, and would cease to be a worry both to themselves and to others.

* * *

The other day the landlord of a public-house, writing to the *Times*, revealed how he had been offered spectacles and false teeth by customers unable to afford the price of a pint of beer. He commented on the "free security" which Mr. Bevan was unwittingly offering the public and which they could use "in exchange for short-term loans." Recently I saw a Greek woman in outpatients who the same morning had flown from Athens because she had been told there was no further treatment which she could be given for an advanced carcinoma of the breast. While sympathising with her in her distress I could not help pondering on the fact that, although she could afford the fare for this long journey, no reward would be forthcoming for the Health Service, the hospital, or of course myself.

Now that it is possible to fly across half the world in three days there seems no reason why the well-to-do patient, advised of the necessity of an expensive and urgent operation, should not balance the price of the air ticket against the surgeon's fee, and, if the latter is the greater, come and have the job done here for nothing by someone equally experienced. Australian and New Zealand papers please copy.

* * *

". . . The female threadworm rarely oviposits before leaving the bowel." This comes from an American journal and I hope it will not catch on here or we shall start asking our neighbours "How are your hens ovipositing?" or awarding certificates to virtuous hens for prolific oviposition. Surely threadworms could lay eggs like anything else.

Letters to the Editor

SENIOR HOSPITAL MEDICAL OFFICERS

SIR,—The medical staff committee would like to support the point of view expressed in your leading article of May 7. Clearly there is widespread concern over the possibility that the authorities will appoint senior hospital medical officers, instead of specialists, solely as a means of economy. It would of course be quite practicable for them to populate this category with medical officers who are in effect doing specialists' work and accepting all the responsibilities of such work. The situation is not made any happier by what appears to be a complete change of policy in this all-important matter. The original expressed intention was to make the category of senior hospital medical officer a diminishing one—in other words, this group would get ever smaller—but now, according to an inspired rumour, this category is to be regarded as the normal intermediate step between trainee specialists and specialists, and is often to be a permanent grade.

The position urgently needs clarification in the interests of all concerned, because it does seem that this will be contrary to the principles of the Spens report, which the Government accepted.

D. SHAW
Chairman.
D. E. BUNBURY
Vice-chairman.
A. R. SAMUEL
Hon. secretary,
Medical Staff Committee.

Belmont Hospital,
Sutton, Surrey.

SIR,—Surely it is not desirable to appoint doctors who are not specialists to do specialised work in hospitals. Why aim at a low standard? On the other hand is it honest to degrade specialists to hospital medical officers?

If some of the doctors at present working in the hospitals, who are not trainees, are really not of specialist standard, would it not be well to class them as assistant or associate specialists, and let them be given a certain amount of advice and instruction from full specialists in the same branch as themselves, with the assurance that they will be recognised as full specialists if they reach the required standard? It would be perpetuating the worst feature of the old municipal hospital system to keep certain hospital doctors in an inferior grade with the knowledge that no matter what they do they cannot get out of it.

The financial position of the country is not good, but few more foolish economies could be imagined than to discourage the specialists and would-be specialists who are working in the hospitals.

St. Benedict's Hospital, London, S.W.17. M. WALKER.

LEPROSY

SIR,—Having specialised in leprosy for close on twenty-five years, and having returned to this country on short leave, I am much interested in the publicity now being given to this subject.

The possibility of a considerable increase of leprosy in Britain should be a matter of concern to all. Your annotation of May 21 follows the usual pattern with regard to leprosy whenever the subject is discussed. Is it necessary in the year 1949 for you to use the word "leper"? I would remind your readers that the International Leprosy Congress held in Cuba in 1948 recommended that this word, so full of stigma, should be banned. To talk of a "leper hospital" is as repugnant to the leprologist as the words "consumptive sanatorium" would be to the tuberculosis specialist. It is more than time, Sir, that leprosy was looked upon primarily as a medical problem, and only secondarily as a social one. The recent emphasis on sulphone therapy is liable to revive the cry "stamp out leprosy in one generation from the Empire," and indeed your annotation strengthens this hope. Not unless the Empire contracts more rapidly than even the most pessimistic might expect will there be any possibility of the fulfilment of such a dream.

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I do not wish to dwell on the subject of leprosy in India or the Colonies, except to say that, as in tuberculosis so in leprosy, the preventive aspect is one that needs the greatest attention, and fundamental public-health principles are liable to be forgotten in our enthusiasm for new drugs. Further, few understand that the greater part of leprosy is an orthopædic problem, and it is tragic when one realises how little interest is shown in this aspect of orthopædic surgery.

Dr. Gordon Ryrie's statement that the number of cases of leprosy in this country is on the increase is undoubtedly true. Twenty years ago it was estimated, with fair accuracy, that there were about 100 cases. Since then we have had large numbers of troops fighting in areas of high leprosy endemicity. Let us remember that while adults are largely insusceptible to the disease, 3–5% of them may be relatively highly susceptible and acquire leprosy through a chance heavy infection. Further—and this is a point of public-health importance—the majority of those acquiring leprosy of the European racial group develop infective lepromatous leprosy. It is therefore obvious that even under conditions prevailing in this country the question of the limited spread of the disease to the indigenous population is not merely academic: where precautions are not taken, such patients would constitute a definite danger to children, and to a small percentage of adults who may come in close contact with them.

My plea therefore is, that while the social-welfare, the humanitarian, and the spiritual aspects of leprosy can best be dealt with by a voluntary or religious organisation, the education of the public with regard to leprosy and the facilities for the medical care of patients is essentially a government responsibility. It is not enough to think in terms of the care and hospitalisation of a dozen or two dozen cases of leprosy; plans should be worked out envisaging the need for the proper treatment in a modern hospital ultimately of 100–150 cases. There is urgent need for an efficiently run, first-class leprosy institution, and this should be in the charge of an experienced leprologist. An intelligent and statesmanlike policy would do more than anything else to bring this subject out into the open, for the sufferer from leprosy will then realise that he will be given up-to-date treatment under conditions of sympathy and consideration. Only in this way will those who have been unfortunate enough to contract leprosy feel that they are being treated reasonably, humanely, and in an understanding manner, and not hide for fear of discovery with its subsequent ostracism, as often happens today.

I should like to suggest that we assume far too facilely that leprosy mainly attacks the weak and the ill nourished. As far as my experience goes in India, leprosy appears to be no respecter of persons; the poor and the rich, the well nourished and the undernourished, few escape if three conditions are present—the infective case, the child or adolescent, and opportunity for close and personal contact.

Bromley, Kent. R. G. COCHRANE.

CHLOROMYCETIN IN TYPHOID FEVER

SIR,—In his article of May 21 Dr. Bradley says: "An unfortunate feature in the present series has been the delay in the initial diagnosis and, consequently, in admission to hospital of many of the patients." This can only be taken to mean that Dr. Bradley imputes to the two general practitioners in Crowthorne some degree of tardiness or inefficiency, resulting in unjustifiable delay in diagnosis and appropriate action. Coming from a senior medical officer of the Ministry of Health, this is a serious charge. Dr. Forbes Fraser has already replied on his own account, and as the other doctor responsible for the handling of the early typhoid cases here, it is now my turn to defend myself.

The following are the dates for the first three cases sent to hospital from my practice:

Case no.	*First visited, April*	*Admitted to hospital, April*	*Interval, days*
1	23	26	3
2	23	29	6
3	25	29	4

Two houses were, in the first place, visited by Dr. Norman Wood, the bacteriologist, at my request:

House	*First visited, April*	*Bacteriologist visited, April*	*Interval, days*
A	24	29	5
B	29	30	1

All cases were visited by me on the same day as the messages were received. The last column gives the interval that elapsed between my first visit to the patient and admission to hospital or examination by Dr. Norman Wood, as the case may be. The longest interval is 6 days, and the average for the series is 4 days.

Crowthorne, Berks. EDWARD CHAPMAN.

*** We have shown this letter to Dr. Bradley, who writes: "I sympathise with this protest, and shall be grateful if you will publish an apology to Dr. Chapman and Dr. Forbes Fraser. I did not intend my comment to suggest that the delay, which can be explained in other ways, resulted from tardy diagnosis or inefficiency on their part. I have been told how well the practitioners of Crowthorne handled a situation which called for a lot of hard work, and I deeply regret that they have been further troubled by my words, which have played a trick on us. I assure Dr. Chapman that there is no need for him to defend himself."—Ed. L.

THE TRAINED NURSE

SIR,—It is reassuring to realise from your leading article of May 28 the interest taken in the problems that confront the trained nurse. Unfortunately the energetic and enlightened attitude displayed by such articles towards these problems is considerably in advance of that exhibited among many members of our own profession. Too many these days expect "something for nothing," and it would be fruitless to attempt an improvement in the conditions and status of trained nurses without exacting a comparable improvement in the standard of nursing generally. A point that often escapes notice is that in practice it is not the number of nurses but the quality of their work that will determine the welfare or otherwise of the sick people in their care. The recent increase in salary, which in fact does not amount to a very considerable cash gain, is, as your article observes, one step in the right direction; but there appears to be danger of several steps in the wrong direction if the passage of the Nurses Bill is to bring about a reduction in the length of training for State registration, and the closing of the supplementary Registers.

The aim, and often the achievement, of the recruiting services at the moment seems to be to bring to the hospitals relatively large numbers of very young girls, enthusiastic no doubt, but whose enthusiasm, being that of inexperience, is shortlived. Few who have any intimate knowledge of hospital training schools will deny that disaffection and aimless grumbling are distressingly prevalent, and intelligent discussion or constructive thinking conspicuously rare. Few will deny, either, that nursing ought to number among its ranks as high a proportion as possible of those who exhibit the highest qualities of character, intelligence, and integrity.

Surely the aim of those who serve the sick, nationalised or otherwise, has always been the care and comfort of the patient. Obviously to attain this aim an adequate nursing staff is an essential factor without which all other plans collapse. But their adequacy does not necessarily lie in numbers. Four nurses whose heart and interest are honestly centred round their work can achieve more, in terms of satisfaction to their patients and themselves, than six or eight who, in the current phrase "couldn't care less."

Far more important than the recent increase in salary is that somewhat nebulous issue—"the raising of the status of the trained nurse." Obviously this must largely depend on the nurse herself. The student nurses have made some attempt at organisation in the Student Nurses Association, and any trained nurse may become a member of the Royal College of Nursing; but the

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necessary improvement in status is not to be achieved by unions or associations, it is something of a more personal and elusive nature—a matter of a change of attitude among members of both nursing and medical professions. At the same time, this change of attitude must be warranted: it must be deserved by a high standard of nursing service.

If the age-limit for entrance to training schools were raised to 19 years, and it became clear to entrants that a very high standard of personal conduct and professional service was expected, it should be possible to offer in return complete personal freedom from interference and an absence of collegiate rules and restrictions which have an unfavourable effect in determining the attitude of nurses and the atmosphere in nursing communities. This together with a scale of salaries at least as high as those of female physiotherapists and other "medical auxiliaries" ought to attract suitable candidates; but far greater advantage would accrue from their recognition by their elders and betters as responsible members of the most enthralling profession and of society generally.

There is a good deal of astute psychology in the "England expects . . ." attitude. Often the more that is demanded of human nature the more it becomes prepared to give.

This is clearly a problem that will not be easily or quickly resolved—there are many quarters in which it is easy to imagine the indignation with which these remarks will be rejected as impertinent. But fortunately the very considerable discomforts, deterrents, and disadvantages attached to becoming and remaining a trained nurse can never quite overcome the main attraction of work—the sick person and his needs.

London, E.2. JÉAN POULTNEY.

SIR,—Your leading article of May 28 suggests that the time has come when nurses and young doctors should mess together in hospitals. I do not agree with this, nor do I think that the time will ever come. My reasons are:

(1) It is at lunch with one's colleagues, be they junior or senior, that a good deal of controversial medical discussion goes on, with benefit to the knowledge of all concerned.

(2) The spirit of bonhomie that exists in many of our residents' messes today would be undermined by such a break with tradition.

(3) It is not easy for the newly qualified practitioner to assert his authority over the nursing staff (as is sometimes necessary), and the form of compulsory social intercourse you suggest would increase that difficulty.

(4) I cannot speak with any confidence from the standpoint of the nurse, but from my experience of that profession I do not feel that such a dubious privilege as mixed messing would do much to influence nursing recruitment.

I hasten to dissociate myself from any strong feelings as to the relative social status of doctor and nurse. I do not think that this enters into the argument at the moment. I believe that there are far more cogent reasons for advocating separate messing facilities for medical and nursing staff, some of which are mentioned above.

Farnborough, Hants. JOHN S. TAYLOR.

SIR,—While all will be glad at long last to see the upward trend of the pay of the trained nurse, I feel that misunderstandings may arise from your query as to why the newly qualified nurse should start at a gross salary of £315 while newly qualified almoners or physiotherapists get £330 and £340 respectively. The nurse who lives in hospital on that salary is infinitely better off than the one who may have to live out, for it is not possible to provide comparable conditions outside for the emoluments allowed. Those who have lived both in and out of hospital, will, I think, bear me out in this. The almoner and the physiotherapist usually live out, and normally pay entirely for their training and maintain themselves in the meantime—a very costly business for three years. The almoner usually ends with a university degree in social science, and the physiotherapist must also take part of her course at the university. Textbooks are another very costly item, and the educational standard required for entry usually means that these girls have been a financial burden on their parents much longer. A great proportion of those becoming nurses have left school at 15, and are completely maintained and trained and provided with uniform during training.

It seems to me one might as well ask why the newly qualified nurse is not paid as much as a doctor. As you say, comparisons are odious, and a universal yardstick is not possible. One usually tries to choose the work for which one is most suited, given the necessary capacity. One hears arguments about the cook receiving more than the nurse and so on; all have their great value to the community, but surely it is impossible to have a fixed position in which one must not be paid more than the other. Maybe we are reaching a position in which all will be paid adequately, irrespective of the kind of work; but even then I should have thought that it would be conceded that those who have spent large sums on their professional training should receive some slight recognition of this in their scales of pay received on qualification.

I feel I am justified in writing this, for I have qualifications in nursing as well as in physiotherapy and radiography.

Bath, Somerset. WINIFRED MENZIES.

ALLOWANCES FOR PROFESSIONAL WITNESSES

SIR,—There will be many of your readers who have been annoyed to find that they are not eligible for payment of a professional witness allowance for attending the Criminal Courts to give professional evidence, in accordance with the scales recently defined in the Witnesses Allowances Regulations, 1948 (Statutory Instrument no. 1909; L.23), as published in the *British Medical Journal*, Sept. 25, 1948 (suppl., p. 129).

The reason for this refusal by the courts to pay such witness fees is that the Home Office issued a circular on Aug. 26, 1948, to all clerks of the peace, clerks of assize, and clerks to justices, giving guidance in the implementation of the Witnesses Allowances Regulations which came into operation on Sept. 13, 1948. This circular stated that professional witnesses' allowances should not be paid to salaried officers who did not lose remuneration by reason of attending court, with the result that professional witness fees have been refused to many doctors working in whole-time salaried posts (in hospitals and other public-health services, &c.), to their great indignation.

My society was concerned about this position and took counsel's opinion with regard to the validity of the Home Office circular which, unlike the regulations, had not statutory force. Counsel advised that paras. 2 and 5 of the Home Office circular appeared to be conflicting.

The Home Office appear to concede in para. 2 that a witness specifically called in, because of his expert and professional qualification, may be given an appropriate allowance. In para. 5 they exclude salaried officers without giving any indication that the court ought to take into consideration whether or not the giving of evidence may fairly be regarded as incidental to the officer's ordinary duties, and whether trouble or loss of time has been occasioned.

The society made representation to the Home Office requesting that the circular should be revised, but was informed that the Home Secretary would not be prepared to depart from the statement in his circular that professional witness allowances should not be paid to salaried officers. It was accordingly decided to seek the ruling of a High Court judge on the proper construction of the Costs in Criminal Cases Act, 1908, and the Witnesses Allowances Regulations, 1948, on the following grounds.

Subject to the regulations, there may be allowed such sums as appear to the court reasonably sufficient to compensate the witness for the expenses, *trouble or loss of time* properly incurred in or incidental to the giving of evidence. It is the duty of the taxing officer to "ascertain the amount" of costs which the court has directed to be paid out of public funds. In the ordinary way, the taxing officer ascertains the amount without reference to the court and he has been guided by the instructions contained in the Home Office circular. Accordingly, the refusal by a taxing officer of an appropriate allowance to a hospital doctor who was salaried

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and lost no remuneration by attending court, on the grounds that such an allowance conflicted with the directions in the Home Office circular, was recently challenged, and it was contended that the particular witness had not been compensated for *trouble or loss of time* which attendance at court necessarily involved.

An application for the reconsideration of the fees to be allowed in this case and for a ruling on the principle to be applied was heard by Mr. Justice Devlin in chambers. It was argued that para. 5 of the Home Office circular was too narrow, as, if the doctor had been an ordinary general practitioner, he would have incurred the expense of having to employ the services of another doctor to attend to his patients during the time he was absent at court, or, if he did not adopt this course, he would have to see his patients in time which he might otherwise have devoted to leisure.

Mr. Justice Devlin agreed with this contention and stated that he would direct the clerk of assize that the directions in para. 5 of the Home Office circular (re professional witness fees to salaried officers) were too narrow, and the mere fact that a practising doctor does not lose income is not sufficient to reduce him to the status of an ordinary witness. He further stated that it was for the clerk of assize to assess what amount should be paid for the trouble and loss of time.

It is suggested, therefore, that salaried doctors who find themselves in a similar position of having been refused a professional witness allowance in accordance with the scale described in the Witnesses Allowances Regulations, 1948, should argue the point whenever it arises, and should appeal to the judge or chairman of the court if the taxing officer refuses the appropriate allowance, making use of the opinion expressed by Mr. Justice Devlin as described above.

This legal ruling will be brought to the notice of the Home Office, and it is hoped that the offending paragraph in the circular will be revised.

ALISTAIR FRENCH
Secretary, The Medical Protection Society.

Victory House, Leicester Square,
London, W.C.1.

THE MEDICAL ILLUSTRATOR

SIR,—If medical students were to become scientists alone, and not clinicians, I could more easily understand Dr. Lawrie's distaste for the caricature diagram (May 21).

It is not suggested that this method of teaching should play a major part in the teaching of medicine, but that it should be supplementary to the universal methods Dr. Lawrie mentions. When employed correctly, it seems to serve to impress facts which perhaps do not receive their correct emphasis elsewhere. Lest it should be thought, however, that this type of instruction is considered tried and proved by pædiatric students at Guy's, I should like to point out that it has been only recently introduced by Dr. Mac Keith. If on further acquaintance it is found to insult our intelligence, we shall not hesitate to say so.

D. J. STOKER
Guy's Hospital, London, S.E.1. Fourth-year Student.

THE NEIGHBOURS' CHILDREN

SIR,—I write in a spirit of inquiry, and in the hope that others may quash my forebodings with an overwhelming volume of evidence in rebuttal. I have a daughter (adopted) aged five and a bit: she is healthy, happy, supremely secure, and apparently well adjusted. But among her circle of a dozen or more friends of the same age there is not one child who does not show signs of some psychological trouble, in many cases severe enough to induce comment by its parents in the course of casual social conversation.

Is this a general experience, and do others live among communities where psychoneurosis is as prevalent as in my suburb? If the answer is No, then there is material for investigation of the local cause. If the answer is Yes, then I would ask whether these children are suffering from the effects of birth and infancy in the doodle-bug era, or whether they are the unfortunate victims of a parental prolongation of the pre-war "suburban neurosis."

If such a state of affairs is widespread, I fear that there is little hope for an improvement in family security, and all that accrues from it, in the coming years, unless a greatly increased child-guidance service can stabilise the personalities of these children. But I hope that my experience is unusual, and that such gloomy thoughts are needless. I dislike anonymity as much as anybody, but I ask you for obvious reasons to accept the signature of

PRO JUVENTUTE.

A PLAN FOR THE AGED

SIR,—Dr. J. V. Walker's letter of May 14 reveals that my article, to which he refers, was not sufficiently clear. Instead of emphasising the hospital treatment of the aged sick, I was urging that the problem was one of social and preventive medicine which could only be met by a combination of preventive and therapeutic measures, with the emphasis on the former. I agree that possibly the maternity and child-welfare service provides a better analogy than the tuberculosis service, and I certainly agree that the next great development in the field of public health will be in the care of the aged.

London, S.W.1. C. A. BOUCHER.

DECAMETHONIUM IODIDE IN ANÆSTHESIA

SIR,—In view of the four articles on this substance, in your issues of May 7 and 14, and the general release of the drug to the medical profession, I feel that it is my duty to sound a warning note.

The combined committee of the Medical Research Council and the Royal Society of Medicine (of which I am a member) has not yet issued its full report, and I personally do not believe that the drug has yet been adequately tested and its effects on the human subject fully explored. I feel sure that indiscriminate use of this potent relaxant will lead to avoidable fatalities, and the utmost caution should be observed by anæsthetists.

St. Albans. C. LANGTON HEWER.

STRANGULATED HERNIA TREATED BY NATIVE ENTEROSTOMY

SIR,—I was interested to read in your issue of April 9 Dr. Browne and Dr. Waddy's description of the sequelæ of native treatment of strangulated hernia, by enterostomy with the actual cautery. I saw a similar case in Navrongo, in the Northern Gold Coast, in 1946, not far from the scene of Browne and Waddy's surgical tour-de-force.

My patient was rather more skilful than theirs, and he incised the anterior wall of his inguinal canal with a sharp knife; this relieved the strangulation without injuring the bowel. Unfortunately the bowel herniated through the incision, and the patient was left to contemplate several feet of his ileum emerging from his little wound.

The patient applied cow-dung, powdered charcoal, and other patent native remedies, to the herniated intestines, but after three days they had not returned to the abdomen; he therefore wrapped them in a dirty cloth, mounted his donkey, and rode ten miles to the main road, whence he obtained a lift to hospital on a passing lorry.

When I saw the patient he was surprisingly fit, but with about four feet of bowel, covered with every sort of filth, nestling on his right thigh. It was obviously impossible to return the bowel to the abdomen, so the whole horrible mass was amputated. The free ends of bowel were anastomosed, and the incision (made by the patient) closed after debridement. The patient never gave a moment's anxiety, and recovered rapidly and completely. I often saw him during the following year, and his hernia recurred, since I had made no attempt to remove the sac. I successfully persuaded him that any further surgical intervention by a physician, in a so-called hospital unequipped for major surgery, might be tempting Providence once too often.

One cannot but admire the courage and resource of these patients, living as they do out of range of medical care, who by rough native surgery enable their lives to be preserved and the results tidied up by a doctor. It is to be hoped that one day governments will be established in our Colonies which will provide medical services that will render cases such as these unbelievable anachronisms, instead of common occurrences.

Medical Research Institute,
Accra, Gold Coast. MARK HUGHES.

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Parliament

National Health Service (Amendment) Bill

IN the House of Commons on May 24 Mr. JOHN WHEATLEY, Lord Advocate, moved the second reading of this Bill. He said that the objects of the Bill were to clarify, and as far as necessary to amend, the application to partnerships of the sections of the National Health Service Acts which prohibited the sale of practices by doctors in the service and which compensated them for the loss of the selling value of the goodwill; to carry out promises of amendment made to the medical profession in the discussions of the application of the Acts, both before and since the beginning of the service; and to make minor administrative changes which experience had shown were desirable for the smooth working of the machine.[1] The Bill was essentially a minor measure which embodied no change of principle or policy. Experience did not suggest any respects in which major amendments were required. The Bill, Mr. Wheatley claimed, should go a long way to remove doubts which had lingered in the minds of certain people as to the position of the medical profession under the scheme. The Minister of Health and the Secretary of State for Scotland had never spared themselves in their endeavours to create a smooth-working and harmonious scheme which would do justice both to the beneficiaries and to those who operated it, and this Bill was an earnest of their intention to carry on that policy. Even those who voted against the original Act must realise that this Bill was but a further step in the development of a scheme which in its short span of ten months had already invoked the admiration and respect, not only of the people of this country, but of the people of the whole world.

Sir HUGH LUCAS-TOOTH said that the title of the Bill would allow amendments to be put down covering a great deal of the original discussions on the National Health Service Bill. But the Opposition did not regard this as an occasion to make fundamental changes, which would only delay the passing of this Bill which they were anxious to see on the statute-book. The fundamental trouble they found in the National Health Service Acts was that the choice of priorities was all wrong. These Acts were founded on two fallacies—that unlimited money would be available and that it was only expenditure which was needed to provide good health services. The Opposition's view was that where money was limited its expenditure on matters of life must have priority over others, even though these were more popular. The Acts were working the other way about. Free spectacles were an admirable thing, but were rarely matters of life. The more free spectacles were available the longer became the queues for the hospitals. The Opposition appreciated that this Bill did not provide an opportunity for dealing with that. This change must be dealt with partly by administration and only partly by amendments, which must be made not by the present Government but some other Government which had a better attitude to these matters.

Mr. ANEURIN BEVAN interposed that it was competent for the Opposition to put down amendments removing from the range of free issues any part of the health service.

Mr. FRANK BYERS, voicing the Liberal view, said he did not think it did much good to indulge in recriminations about the National Health Service at this time. What was needed more than anything else was an atmosphere of national good will towards the service, which presented difficult problems not likely to be solved in one year, or five years. Possibly priorities in the service would have to be revised, but there should be an end to the ceaseless propaganda about the need to cut down expenditure. If we were to deal adequately with the health of the people any economy we could make in the scheme would have to be used to build things like health centres. Any idea of slashing the estimates would merely retard the period when we could reduce the cost naturally because we had put the preventive side of medicine into good working order.

1. The Bill was summarised in the *Lancet*, May 21, p. 880.

AN EXPANDING SERVICE

Mr. FRED MESSER said that no reasonable person would suggest that money should be poured out unnecessarily, but so important was the health service that it should be the last thing on which we should economise. The Minister had given the doctors in this Bill more than most people would consider necessary.

It should not be imagined, Mr. Messer continued, that the medical profession were completely agreed as to the encouragement of part-time specialists. He read a letter from a general practitioner, not a Socialist, describing how on several occasions recently he had sent children for tonsillectomy to local hospitals. The parents had been told that they must wait from nine months to two years, but that the operation could be done at once privately by Mr. So-and-So—the surgeon who had just seen the children in the outpatients' department under the National Health scheme. That, said Mr. Messer, was one of the dangers of the part-time specialist. He did not mind the specialist taking his paying patients into the hospital provided there was no hindrance to other cases which were awaiting operation. He suggested to the Minister that this case showed the need for regional boards to have rather more authority over management committees.

Mr. Messer realised, however, the value of part-time specialists, such as thoracic surgeons. There were not enough of these specialists, and it would be wrong to insist that every specialist should be full-time, for that would mean that he could not distribute his skill over a wide area. That did not mean, however, that they should encourage the view that the part-time specialist service was the best they could provide. Medical men working in hospitals felt that they were suffering from a comparison between their own position and that of the part-time specialist. He cited the fees for travelling-time, domiciliary visits, and locum-tenens work which the part-time specialist could earn. Too much importance, he felt, was being placed on the proviso that in no circumstances would a regulation be introduced making all specialists full-time. As the regional hospital boards had a special interest in the specialist service Mr. Messer further suggested that they might have the responsibility of providing facilities for postgraduate study.

The fact must be faced, Mr. Messer ended, that it was doubtful whether as the health service expanded expenditure would decrease. Costly though it was now, we had not by any means got the service which was required. For instance, at present there were old people in their own homes because they could not get a bed in hospital and the difficulty of admitting them to hospital arose largely because there was nowhere to send them on discharge.

Mr. PETER THORNEYCROFT said there was a danger to the health service in the mounting costs, which was visible already in the cuts which had had to be made in some of the hospital estimates. If the country was to enjoy a National Health Service, no matter what political party was in power, in the long run it had to earn the benefits. But if he had a criticism of this Bill it was not so much what was in it as what had been left out. On the question of analgesia in childbirth, his desire had always been to effect an important reform of the law, irrespective of any personal or party point of view, and if the Minister could see his way to accept at the committee stage the two new clauses on the order paper in the name of Mrs. Manning, Mr. Thorneycroft would withdraw the Analgesia in Childbirth Bill.

Dr. A. D. D. BROUGHTON, in welcoming the Bill, said the Minister had had a difficult task in dealing with the representatives of the medical profession. The Minister wanted to be reasonable, fair, and just, and he had made compromise after compromise. But had he not now gone too far in trying to meet the demands of that section of the profession which were most opposed to his political views? The day might come when the medical profession wanted a full-time salaried service and would have difficulty in obtaining one if this clause

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became law. The Minister was pampering a section of the profession which was most politically prejudiced and panic-stricken.

PRIORITIES

Mr. JOHN BAIRD wished that the Bill included a clause on the priority class in dentistry. By the Act of 1946 the Minister should provide a priority service for children and expectant mothers, but he had no power to implement the Act. Today the establishment of school dentists employed by local authorities was under 50%. He was sorry that there was nothing in the Bill enabling the Minister to take over this service and run it on a regional basis.

As a doctor and a realist Dr. HADEN GUEST said he did not get excited about the marvels that could be done, but he was often amazed at the extraordinary things that were being done by modern medical research. True they could not all be applied at once, but the fact that women and children were now able to get treatment without paying fees had meant a revolution in their health. Another great advantage of the Act would be the reorganisation of the hospital system and the distribution of adequate specialist staffs in all areas.

Colonel M. STODDART-SCOTT would have liked to see an amendment altering the method of nomination of members to the regional hospital boards. After one year's operation no fewer than 32 members had not been reappointed by the Minister. He did not believe that regional hospital boards had carried out their duties in respect of the aged sick. Why was the accommodation for the aged and chronic sick available before July 5, 1948, no longer available? Mr. BEVAN interposed that there was more accommodation now than there has ever been, but that there was more need for it. But Colonel STODDART-SCOTT pointed out that before July 5 it was obligatory on local authorities to provide accommodation for these cases, whereas now it was no longer obligatory on anyone. When people got very old and were a little muddled it was found that the only hospital accommodation was in a mental hospital. At one Birmingham mental hospital during 1947–48 only 20 people over 65 were admitted, while during 1948–49 93 were admitted. He hoped it would be possible to amend this Bill so that an obligation was put either on the local authorities or on the regional hospital boards to provide accommodation for the aged sick.

Before the Bill reached the statute-book it ought to be possible to lay down certain priorities. It appeared that it was not possible that all the things which the principal Act promised could be made available, and the first priority was an adequate hospital service. At some general hospitals in the north of England out-patient attendances had been doubled. It was therefore remarkable that the first drastic cut which the Minister had imposed was on the element which had borne the brunt of the whole health services. It was more important that hospital beds should be available than that people should be able to obtain two pairs of spectacles or that wigs should be given to foreigners. If people could be assured of hospital accommodation he believed they would be willing to make a small contribution to its cost.

Sir WAVELL WAKEFIELD suggested that there should be a substantial reduction in charges for private beds and that such charges should be on a uniform basis throughout the same region. Alternatively whatever expense there would have been to the State should be allowed for in charges on private beds.

PAYING FOR THE SERVICE

Lieut.-Colonel WALTER ELLIOT was sure the Minister of Health would agree that as long as there were 50,000 hospital beds in existence but not staffed nobody could say that we had solved the problem of producing an adequate health service. There had been considerable uneasiness and distress among the medical profession. The Minister of Health was a heavyweight boxer of the most formidable character. He might be called a bruiser. (Laughter.) Anyone getting into a rough-and-tumble with Mr. Bevan was bruised both mentally and physically, and there was a deep Freudian bruise in the mind of the medical profession about those negotiations which were conducted, to quote their former chief of staff, more as a military operation than as a kind of negotiation. The Minister was doing his best to dispel that, and Colonel Elliot thought that this Bill was an earnest of that. He thought it carried out the promise of the Minister. There might well be further steps to be taken, but these would be a matter for future discussion.

The Conservative Party, he continued, did not propose to cut the health services. They recognised that the cost of those services had not yet reached its peak, and the money to complete them would have to be found. The nation had set before it a noble aim, but he did not think it would be possible to lift the matter above party politics. The air of peace which hung over matters which were above party politics was often the peace of death. The health service, he ended, was a live decision, taken after live discussion. Let the discussion go on, and in that way a policy would emerge and the future of the nation be finally worked out.

Mr. BEVAN, replying to the debate, said that most of the doubt and anxieties which the doctors had been suffering were a direct consequence of the unbridled propaganda of some leaders of the medical profession at the time of the passing of the Act. No-one could say that the clauses which the Government had been compelled to put in the Bill as a consequence of the examination were less obscure than the clauses in the 1946 Act. Although there were between 15,000 and 17,000 general practitioners in this country this Bill only affected 50 partnerships. Most of the fears that had been expressed had proved entirely groundless.

Referring to the proposed clauses on analgesia, Mr. Bevan declined to say on second reading how he would deal with them in committee. He could not accept them as part of a bargain about a private member's Bill that might never reach the statute-book. Remarkable progress had been made over the last year in the provision of analgesia or anæsthesia. It was not possible for a minister of health to say that any class of patient should have priority. It was part of the psychology of sickness that every sick person must feel that he is receiving as much attention as any other person. The threatened breakdown of the priority dental service was a classical illustration of the foolishness of using such words. No legerdemain or alteration of words in the statute-book would alter physical facts.

Turning to expenditure, Mr. Bevan pointed out that in speech after speech hon. Members opposite had asked for increased expenditure. But they wanted all the items put up and the totals to be down. The amending Bill was wide and the Opposition could put down amendments suggesting what should be taken out of the service. He would welcome suggestions. It had been asked "why on earth should we cut hospital services and issue free spectacles?" In his turn Mr. Bevan asked "By what conceivable alchemy can I transmute a citizen without a pair of spectacles into a trained nurse looking after a patient?" He could not, Mr. Bevan continued, reduce any of these services or make a charge for them without legislation. If the Opposition wished to economise at the expense of the provision of one of the free services let them have the courage to put down an amendment to the Bill. But do not let them go girning around the country saying that the health service was extravagantly administered and ought to cost much less money, and yet demand that the service be given. The administrative expenses of the National Health Service Act worked out at 2·3% of the total cost. In these expenses were included the health division of the Ministry, the price-fixing machinery for the pharmaceutical services, the estimates board for the dental services, all the executive councils, regional boards, and management committees. This percentage was no reason why they should not scrutinise the administrative expenditure as narrowly as possible, but it did mean that there were no great savings to be obtained there.

The cuts to be made by hospital management committees were an attempt by the central administration progressively to exercise financial discipline over the whole service while at the same time leaving the utmost amount of independent action at the periphery, and they would succeed. Regional hospital boards and management committees had been told that in making economies where they could be made they must not make them at the expense of the patients. That meant they must not close beds. It also meant that where it was necessary and advisable to open new beds they must be opened.

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It was only ten months since the service started, and it would have to run for three, four, or five years before they would know what the repetitive annual expenditure was going to be. Reductions had been made, where shown to be necessary, in the remuneration of chemists, opticians, and dentists. To the extent that abuses existed in the health service they arose directly from those parts of the service that had to be articulated through private enterprise. It was difficult to make the motives of private enterprise subserve a great social purpose. But he hoped to put the nimbus of public service upon private-enterprise brows before long, and he believed everybody would take a pride in this service which was an inspiration to the other nations of the earth.

QUESTION TIME

Care of Mentally Defective Children

Mrs. LEAH MANNING asked the Minister of Health if he was aware that there were three low-grade defective children in St. Margaret's General Hospital, Epping; that they were confined to bed in the wards of the aged and chronic sick patients; that they had been there for many years; and what steps he proposed taking to remove these children to more appropriate surroundings in accordance with the spirit of the Children Act.—Mr. BEVAN replied: I am aware that there are three low-grade mentally defective children in this hospital and the hon. Member may be assured that they will be removed as soon as alternative accommodation is available.

Mr. GODFREY NICHOLSON: Is the Minister aware that owing to a shortage of accommodation for mentally defective children and mentally defective people, frequently these people have to be certified by doctors because only in that way can they get a home or shelter?—Mr. BEVAN: I would be loth to believe that children are certified who ought not to be certified merely in order to get accommodation. That is a very serious statement to make. Mr. NICHOLSON: It is true.

Care of Aged Sick

Mr. V. F. YATES asked the Minister if he was aware of the inadequacy of existing facilities for the care of the chronic and aged sick in the city of Birmingham; and what steps he proposed to take to improve such facilities.—Mr. BEVAN replied: The regional board has two groups of experts investigating the problem, and will take further action in the light of their reports. Meanwhile, unused beds are being brought into use wherever possible, and arrangements made with the local health authority for home nursing. Mr. YATES: Is the Minister aware that during the past year more than 90 aged persons, chronically sick, have been admitted to mental hospitals; would he consider this aspect of the problem, especially in view of the fact that I understand about 17 died within one month of admission, which really is a very grave matter?—Mr. BEVAN: With all respect, it is not enough to give the proportion of old people who died within a month of being admitted to hospital. People do die, and the assumption that they died because they went to hospital is one we ought not to make. I would remind the House that during the war a great deal of the E.M.S. was, in fact, housed in separate parts of mental hospitals. They are not in the mental hospital as such, but occupy the same physical accommodation as other people.

Mr. MARTIN LINDSAY: The Minister cannot get away with that. He should be aware that of the first 31 of these aged people of over sixty-five, to whom he has referred as being admitted to hospital, 25 died of heart diseases, which was nothing to do with mental affliction. Is it not absolutely wrong that these old people should be certified as mental cases for the first time in their lives?—Mr. BEVAN: I cannot accept the statement that old people are being certified as mental cases in order to be taken into hospital. That is a gross and offensive charge against the doctors concerned. As for old people dying from heart-failure, well they have been doing so for millions of years.

Mr. P. L. E. SHURMER: I have been the chairman of a big mental hospital in Birmingham and the statement of the hon. Member is quite untrue.

Colonel STODDART-SCOTT: As the Minister must be aware, in the terminal stage of life there is very often muddleness, and it is quite easy to certify people in order to find accommodation for them. Previously they would never have been certified, because there was accommodation available provided by the local authority.

Obituary

STEVENSON LYLE CUMMINS

C.B., C.M.G., M.D. N.U.I., LL.D.

Professor Lyle Cummins, who died at Oxford on May 26, led a life of active service, which began in the late Victorian days as regimental medical officer at the battle of Omdurman and ended in the E.M.S. in the late war. Between these two events he worked in the outposts of India and Central Africa, served in the first world war, participated in Government committees on tuberculosis with visits to the Transvaal and the Far East, and became principal medical officer of the Welsh National Memorial Association, with a chair in the University of Wales. Thus he came to his specialty of tuberculosis by unorthodox paths, by way of Africa and the native races, the Army and official posts, and as a result he saw tuberculosis as an epidemiological study rather than a consulting-room disease.

Stevenson Lyle Cummins, son of William Jackson Cummins, M.D., of Cork, was born in 1873. He came of a well-known Irish family, many of whom attained distinction in the British Army and in medicine. After graduating at the Royal University of Ireland in 1896, he entered the Army Medical Services the following year, and he early saw active service as a member of the Nile expedition in 1898. From 1900 to 1907 he served in the Egyptian Army and in the Sudan, obtaining the Sudan medal and the Osmanieh.

[Press Portrait Bureau

Besides studying tuberculosis among the Sudanese tribes, when it was to them a new disease introduced by Europeans, he investigated the pathology of tropical diseases, including kala-azar and allied leishmania disease, and for several years he worked in close association with Sir William Leishman. When the first world war began Cummins was still a major, but by 1918 he held the rank of full colonel. His work as adviser in pathology to the British armies in France and Flanders was strenuous, exacting, and competent, and it was largely due to his administration and expert knowledge that the pathological services of the British armies on the Western Front were so successful. His post as consultant was no sinecure and he was always ready to visit a case or to place his knowledge at the disposal of a colleague. For his services he was appointed C.M.G. in 1915, and C.B. in 1918, and he was mentioned six times in despatches. He was also appointed officer of the French Legion of Honour and the Couronne de Belgique, and he received the Belgian Croix de Guerre. Among the posts he held during his Army career were the professorship of pathology at the Royal Army Medical College, Millbank, and the directorship of the typhoid vaccine department After the war he served on the Medical History Committee formed by Sir John Goodwin, then director-general of Army Medical Services, and with Leishman he was responsible for the pathological portion of the official history.

In 1921 Cummins retired from the Army to become David Davies professor of tuberculosis in the University of Wales. The chair was at first associated with the post of principal medical officer of the Welsh National Memorial Association for the Treatment of Tuberculosis, and he held the combined appointments till 1927; but the growth of both the administrative and academic departments convinced him that they should be severed, and in that year his position in the association became that of director of research. Writing of this period R. M. F. P. recalls that "Cummins was among the small group of men who came to Cardiff in the early '20s to occupy chairs when clinical departments were added to complete the framework of medical education in Wales.

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In establishing a new medical school they had many difficulties to overcome, and Cummins's enthusiasm, assiduity, and complete lack of self-interest were a great asset. His long military service in remote countries impressed him with the clamant need for teaching and service in tuberculosis in India and Africa. One of his first acts as professor was to persuade the university to establish a diploma in tuberculosis, and to organise courses of study for it. An indefatigable inquirer, always having more plans for research in mind than he could undertake in limited quarters and with a small academic staff, his influence on the large clinical staff of the National Memorial Association was all directed to research. The late E. H. Kettle, Prof. E. L. Collis, and Cummins were all interested in the grave incidence of pneumoconiosis in South Wales, and each of them studied it from his own point of view and wrote much on it. Cummins worked also on the opsonic index and the erythrocyte-sedimentation rate in tuberculosis, and for a time studied gold therapy intensively. But perhaps it is less generally known that he was also a pioneer of B.C.G. prophylaxis in this country and had a substantial investigation under way in 1929–30. If he had found it possible to pursue this investigation we should not now be so dependent upon foreign experiences.

"The most lovable of men, Cummins was intensely serious and unresting at his work, yet hospitable and witty in company; and he had a remarkable talent for gay writing, especially for children."

In 1919 the National University of Ireland had given Cummins an honorary LL.D., and in 1930 he was awarded the Weber-Parkes prize of the Royal College of Physicians of London for his work on tuberculosis. For several years he was an active member of the tuberculosis committee of the Medical Research Council, and he was on the consulting staff of the King Edward VII Sanatorium, Midhurst. He also visited South Africa to advise the South African government on problems of industrial tuberculosis; and his courageous report on conditions among the native mine-workers received less publicity than it deserved. He retired from his chair and directorship in 1938 when he was given the title of emeritus professor.

He had hoped to spend his retirement at his home in Wales, but the outbreak of the second world war brought him back to medical work and eventually to a desk in the War Office. In 1941, when an editorial board was set up to prepare for the official medical history, he became a representative of the War Office on the board's editorial subcommittee. Here his previous experience in editing the history of the first world war was of much value. "At that time," writes a colleague who met him daily, "Cummins was a far from young man and physically almost frail, yet I was amazed at his energy, his immense capacity for work, and his organising ability in setting about this difficult task. All the time he was able to maintain his intense interest in his own special subject—tuberculosis—and up to a point to supervise the practical work .... He never had the appearance of the traditional professor; he retained to the end the Edwardian military bearing. Tall and spare, with only a very slight stoop, he was the handsomely moustached, gracious, and scholarly gentleman. His voice—not unreminiscent of another Colonel held in high affection by the public—was peculiarly attractive, belonging to a generation with which our links are fast disappearing."

Unfortunately, for reasons of health, Cummins had to resign his Army duties in 1942. In retirement at Thaxted in Essex he occupied himself in studying the history of tuberculosis. In 1939 he had published a book on *Primitive Tuberculosis*, which is an interesting ethnological study of the disease in primitive races of mankind. In 1945 and 1946 he read several papers before the history of medicine section of the Royal Society of Medicine on pioneers in tuberculosis from the 17th to the 19th century, which in expanded form were published as *Tuberculosis in History* last April, and reviewed in our last issue. He also had in preparation a biography of Sir Andrew Smith, zoologist, director-general of Army Medical Services during the Crimean War, and initiator of its medical history, the first to appear.

Sir Arthur MacNalty, to whom we are indebted for many of these details, writes: "Lyle Cummins was tall, slight in figure, white-moustached, and gentle in manner and speech. Uniformly kind and courteous, he was liked and appreciated by his colleagues and students. His recreation of fly-fishing suited his contemplative disposition. He knew his own mind and held resolute views on many subjects. Though he sometimes spoke with a charming diffidence, he always, in debate and committee, commanded respect. A perpetual student, he was often to be found in the library of the Athenæum reading and making notes on some subject of medical history. His was a life of high endeavour and fine integrity."

Professor Cummins married in 1906 Eleanor Fenton, daughter of Robert Hall, of Rockcliffe, co. Cork. They had four children.

Diary of the Week

JUNE 5 TO 11

Tuesday, 7th

UNIVERSITY OF LONDON
5 P.M. (Institute of Neurology, National Hospital, Queen Square, W.C.1.) Sir Hugh Cairns: Surgical Principles in Intracranial Surgery.
5.15 P.M. (University College, W.C.1.) Prof. A. V. Hill, F.R.S.: Muscular Contraction. (Second of two lectures.)

ST. MARY'S HOSPITAL MEDICAL SCHOOL, W.2
5 P.M. (Wright-Fleming Institute) Dr. A. S. McFarlane: Electron Microscopy of Bacteria and Viruses.

EDINBURGH POST-GRADUATE BOARD FOR MEDICINE
5 P.M. (University New Buildings, Teviot Place.) Prof. Walter Mercer: Tuberculosis of Joints.

Thursday, 9th

ROYAL COLLEGE OF SURGEONS, Lincoln's Inn Fields, W.C.2
5 P.M. Prof. Geoffrey Jefferson, F.R.S.: Mind of Mechanical Man.

RESEARCH DEFENCE SOCIETY
3.15 P.M. (26, Portland Place, W.1.) Prof. C. Lovatt Evans, F.R.S.: Physiological Research and the Vivisection Act. (Stephen Paget lecture.)

ST. GEORGE'S HOSPITAL MEDICAL SCHOOL, S.W.1
4.30 P.M. Dr. Desmond Curran: Psychiatry lecture-demonstration.

HONYMAN GILLESPIE LECTURE
5 P.M. (University New Buildings, Teviot Place, Edinburgh.) Dr. Reginald Bailey: Mental Deficiency and Social Medicine.

Births, Marriages, and Deaths

BIRTHS

BARKER.—On May 24, at Salisbury, the wife of Dr. P. B. Barker—a son.

BROOKS.—On May 17, at East Bridgford, Notts, the wife of Dr. G. O. Brooks—a daughter.

BUCHANAN.—On May 16, in Birmingham, the wife of Dr. Ian Buchanan—a daughter.

CROFTS.—On May 26, at Farnborough, Kent, the wife of Dr. N. F. Crofts—a daughter.

ENZER.—On May 18, at Cape Town, the wife of Dr. John Enzer—a son.

JORDAN.—On May 26, at Kidderminster, the wife of Dr. J. Jordan—a son.

KLIDJIAN.—On May 22, at Wolverhampton, the wife of Wing-Commander Arsen Kildjian, F.R.C.S., R.A.F.—a son.

RITCHIE.—On May 24, at Aberdeen, the wife of Surgeon Lieutenant J. S. Ritchie, R.N.—a son.

SANDISON.—On May 25, in Glasgow, to Dr. Ann Sandison (née Austin), wife of Dr. Andrew T. Sandison—a son.

WATKINS.—On May 24, at Gorseinon, near Swansea, the wife of Dr. D. A. Watkins—a son.

MARRIAGES

MARTIN—FERGUSON.—On May 21, in London, James Purdon Martin, M.D., to Janet Smiles Ferguson.

DEATHS

CUMMINS.—On May 26, at Oxford, Stevenson Lyle Cummins, C.B., C.M.G., LL.D., M.D. N.U.I., D.T.M. & H., colonel, A.M.S. retd.

ETTLES.—On May 21, in London, Donald Cotman McCulloch Ettles, M.B. Lond., F.R.C.S., lieut.-colonel, R.A.M.C.

GRELLIER.—On May 27, at Hastings, Norman Grellier, M.C., M.R.C.S., D.M.R.E., L.D.S.R.C.S., aged 62.

MARTLAND.—On May 16, William Lionel Martland, M.B. Manc., aged 50.

SHANNON.—On May 28, in London, Frederick Shannon, M.B. Edin., aged 64.

WEBB.—On May 23, at Cheltenham, John Curtis Webb, M.A., M.B. Camb., aged 80.

WIMBERLEY.—On May 26, in Edinburgh, Charles Neil Campbell Wimberley, C.M.G., colonel, I.M.S. retd, aged 81.

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Notes and News

THE MEDICAL RECORD

THE Association of Medical Records Officers, believing that those it represents would benefit from closer cohesion, has started its own periodical, the *Medical Record*[1]—not to be confused with the New York journal of the same name. In the first number the case for full-time training of hospital records officers—one warmly advocated by the association—is set out in an editorial. Plans for a full-time course lasting at least one year are already in hand, and an examining board is to be set up. Dr. Percy Stocks observes that "some hospitals whose record systems were still primeval are awakening from their long sleep and beginning to realise that the best possible results from hospital treatment are hardly likely to accrue in institutions which keep no intelligible records." And Mr. H. Cotton, emphasising the need for training if the standard is to be raised, urges that the bursaries granted by King Edward's Hospital Fund for London, the training scheme for the Oxford region, and the weekend courses run by the association, though all valuable, do not meet the need. The editor of the new journal is Mr. D. G. Davies, who may be addressed at the General Infirmary, Leeds.

WORK OF THE N.C.S.S.

OUR social services, half voluntary, half statutory, are probably as bewildering to a foreigner as Strephon was to the House of Commons. They even need an interpreter to help them to understand themselves; and this exacting post is filled with grace and assiduity by the National Council of Social Service. "The main theme of its work," says the annual report for 1947–48,[2] "is coöperation between voluntary organisations and partnership with the authorities."

The executive committee gives considerable help to those who wish to establish some new and useful project, either temporarily (by forming a group to work on the matter), or more permanently—as happened with the citizens' advice bureaux, which are still centred in the council. One officer specialises in giving technical advice on the building of temporary village halls, including the purchase of the land and planning and contruction; another is secretary of the National Association of Parish Councils, and prepares books and pamphlets on their powers and duties. Associated groups and committees cover special work. Thus local councils of social service are linked in a standing conference, and have their own central committee to carry out the policies the conference lays down. New councils are steadily being established, and collaborate with the local authorities. The National Old People's Welfare Committee influenced the drafting of those sections of the National Assistance Act which have to do with old people, helping to ensure that residential homes should be registered and inspected, and that old people should retain some of their pensions for personal expenses. There were already, when the report was written, 235 local, 17 county, and 10 regional O.P.W. committees. The work of the citizens' advice bureaux is well known. Their success depends largely on the help of skilled voluntary workers, and the central committee are pleased to find these are steadily forthcoming. Family and personal problems are often brought to the bureaux, and can sometimes be referred to a local family welfare agency. But where no such help is at hand the bureau worker may be in a difficulty, for such problems do not properly fall within his scope. The Central Citizens' Advice Bureaux committee is considering what can be done about this situation.

The National Federation of Community Associations works with the council, and local associations are growing in number. Women's Social Service Clubs in industrial areas now number 700, and the national standing conference meets yearly. Like the Women's Institutes, these clubs draw their membership mainly from among married women with homes to run. Since these women lead monotonous and often lonely lives, the clubs provide them not only with the chance to learn domestic crafts but with opportunities for social life. National voluntary youth organisations also have a standing conference which meets monthly, as well as an annual residential conference. A first international conference was held in London in 1948. Subjects discussed include youth work in community centres, the teaching of homecraft in schools, sex education, and the problem of staggered holidays. The conference has also prepared evidence for the Royal Commission on the appointment of magistrates, and reports on the leisure activities of schoolchildren, and the influence of the cinema.

The International Conference on Social Work, planned originally for 1940, was held for the first time at Brussels in 1946, and has been continued since.

1. May, 1949. Published for the association by the McGowan Press Ltd., Pontefract. 1*s*.
2. Focus on Social Work. Obtainable from the council, 26, Bedford Square, London, W.C.1. Pp. 63. 1*s*. 6*d*.

"HELP FOR THE TUBERCULOUS" [1]

ARRANGEMENTS—financial and other—for tuberculous patients have changed considerably in the last few years; and those who have to administer laws and regulations must often be uncertain how, exactly, things now stand. N.A.P.T. has published a convenient booklet on the position of the tuberculous under the National Health Service, the medico-social care available to the patient, his claims to national assistance, and the scope of voluntary care committees, and an intelligent summary of the needs of patients and the sources from which they may be met, opportunities for training and employment, and possible future developments for their welfare. An appendix sets out relevant extracts from Acts of Parliament and official circulars. Social workers, as Dr. Harley Williams suggests in the preface, will find the little book useful; and it can be expanded and brought up to date in future editions. It has been compiled by Miss Nancy Overend, social welfare secretary of N.A.P.T., and Mr. H. F. Hughes, chief administrative officer of the tuberculosis department, Manchester regional hospital board.

MINERS AFTER INJURY

WE have so much serious reading to get through that little books which set out facts mainly by means of diagrams and isotypes are apt to entice the eye. "Learning at Every Step"[2] describes reablement by the Miners Welfare Commission, and is well designed to show pictorially the growth of reablement centres and centres for special injuries, the sites of these centres, the relationship between hospitals, centres, and surgeons, the purposes of treatment, the value of games, occupational therapy and physiotherapy, the arrangements for resettlement, and the results six months after discharge from the centres. The final chart of small stocky figures shows 61% back at their former work, 28% on light work, 3·5% transferred to other industries, 1% permanently retired, and 6·5% not working or returned to hospital—not a bad record. It is important that results should be as good as possible, for the accident-rate in mining is six times as high as in the factories. The commission's reablement scheme covers 84% of the miners employed.

1. Published by the National Association for the Prevention of Tuberculosis. Pp. 40. 5*s*.
2. Produced for the Miners Welfare Commission by Design Research Unit. Pp. 38. 2*s*.

University of Cambridge

On May 28 congregation sanctioned a grace to confer the honorary degree of D.SC. on Viscount Addison, Prof. C. F. Cori, Sir Charles Harington, F.R.S., Prof. A. W. K. Tiselius, and Dr. Jacques Tréfouël.

The university has established a professorship of human ecology which is at present limited to one tenure, and which will be primarily assigned to the faculty of medicine. Dr. A. L. Banks has been appointed to be the first holder.

Dr. Banks, who is a principal medical officer of the Ministry of Health, is responsible for the region which includes Cambridge. This work has brought him into close contact with the problems of human ecology. After qualifying from Middlesex Hospital in 1926, he graduated M.B. Lond. the following year. He held house-appointments at the Middlesex and at Warneford Hospital, Leamington, before joining the staff of the London County Council where he became a divisional medical officer. He has also lectured at the University of Durham and the London School of Hygiene. In 1931 he took his M.D. Lond., in 1946 he was awarded the honorary degree of M.A. by the University of Cambridge, and last year he was elected F.R.C.P. Dr. Banks is a barrister-at-law of Lincoln's Inn. His published work includes papers on the Infirm and Long-Stay Patient, the National Health Service Act, and Euthanasia.

University of Liverpool

At a recent examination for the diploma in tropical medicine and hygiene the following were successful:

R. Buri, J. A. Byrne, H. A. Charchafchi, M. G. Corcos, E. J. Fleischer-Djoleto, W. J. Foote, J. Gemmell, J. Haworth, J. C. V. Murphy, W. L. Palmer, D. Phukan, G. Pringle, K. L. Stuart, S. W. Thomson, R. C. Troup.

The Milne medal in tropical medicine has been awarded to Dr. J. Gemmell, and the Warrington Yorke medal in tropical hygiene to Dr. K. L. Stuart.

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Royal Free Hospital

On Wednesday, June 8, at 3 P.M., in the senate house of the University of London, W.C.1, the Duchess of Gloucester will present the prizes to the students of this school.

Middlesex Hospital Club

The 83rd annual meeting of this club was held on May 25. The chair was taken by Mr. Gerald S. Hughes of York, and among those present was Lord Webb-Johnson, P.R.C.S.

Memorial to Army Sisters

On May 28 Field-Marshal Sir William Slim unveiled a plaque at the Queen Alexandra's Military Hospital, Millbank, London, in memory of the nurses of Queen Alexandra's Royal Army Nursing Corps who lost their lives during the second world war.

Swiss Anti-tuberculosis Plan Rejected

In a referendum held on May 22 the Swiss electorate rejected by 612,000 votes to 201,000 the new federal law against tuberculosis (see *Lancet*, May 28, p. 942). According to the *Times* correspondent at Geneva (*Times*, May 23) the adverse vote may be ascribed to opposition to any State controls, and consequent bureaucracy, and to the inefficiency of X-raying at too-long intervals.

Edinburgh to Lima

Dr. Douglas Guthrie, lecturer on history of medicine in the University of Edinburgh, has been visiting the universities of Peru, Guatemala, and Mexico. To the most ancient university of the Western Hemisphere, the University of San Marcos at Lima, founded in 1551, he presented three volumes of the *Works of Hippocrates*, printed at Madrid in 1769, which at one time belonged to Dr. Hipolito Unanue, founder of the school of medicine in Lima in 1811. The volumes, which bear Unanue's bookplate, were discovered by Dr. Guthrie in a Glasgow bookshop in 1944.

Dental Reactions

At a meeting on May 26 the council of the British Dental Association reiterated the official policy of the association that it cannot recommend members to take part in the National Health Service in view of the omission of the principles which the association regard as essential for the provision of a satisfactory dental service. The council added that decisions whether, under the new conditions, to remain in the service or to resign must be taken by members as individuals.

At a meeting on May 28 the executive committee of the Public Dental Service Association resolved that it could not recommend members to accept any present cut in pay under the National Health Service. It asked members to await adjustments which might prove justified after negotiations following publication of the Penman report.

Ambulance Services

The increase in calls for ambulances since July has been even greater than was foreseen, and an adequate service can be maintained only if calls are kept to a minimum. The Minister of Health has suggested to the local health authorities that they should discuss with the executive councils means by which general practitioners may help in reducing the strain. Some patients have made private arrangements for ambulance or car transport in the belief that the cost was recoverable under the National Health Service. The Minister points out, however, that though local health authorities' ambulance services are available free of charge, these authorities are not empowered to reimburse the cost of arrangements privately made. Hospital management committees and boards of governors have also been asked to review their arrangements for calling on ambulance services with a view to possible reduction in calls. The greatest increase has been in the calls on sitting-case car services, including the hospital car service, for transport to and from outpatient departments, and it is hoped that where possible clinics will be held at times which fit in with local bus services. For long journeys, it is stated, local health authorities are able to make very satisfactory arrangements with the Railway Executive—e.g., by the reservation of a compartment—for patients, including stretcher cases, who have to make long journeys, to travel the greater part of the journey by railway. "This is generally the quickest and most comfortable method of conveyance, and the use of ambulances and cars for long journeys should therefore be quite exceptional."

Dreadnought Seamen's Hospital, Greenwich

A postgraduate ward round will be held at this hospital at 3 P.M. on the third Thursday in each month until November.

Crichton Royal Fellowships

Fellowships in psychiatry at the Crichton Royal Hospital, Dumfries, have been awarded to Dr. R. W. Bryson, Dr. W. T. McClatchey, and Dr. Elizabeth Crye.

Medical Superintendents' Society

This society will hold its annual general meeting at B.M.A. House, London, W.C.1, on Thursday, June 9, at 10 A.M. On the following day there will be a conference to discuss the problem of the chronic sick patient.

Special Diets for Invalids

Doctors who have not yet received the Ministry of Food's memorandum (Med. 2 revised 1948) which sets out the arrangements for granting extra rations and priority allowances of food to invalids may obtain a copy from their local food office.

Medical Research Council

The appointment of Prof. H. P. Himsworth to the secretaryship of the council from Oct. 1 is announced on another page.

Professor Himsworth, who is 44 years of age, was educated at King James's Grammar School, Huddersfield, and at University College, London. When he graduated M.B. in 1928 he obtained the university gold medal, and two years later he was once more awarded this distinction for his M.D. After holding house-appointments at U.C.H. he became an assistant in the medical unit in 1930. Two years later he was awarded a Beit fellowship which he held while working at the hospital. In 1935 he received the Julius Mickle fellowship and became first assistant in the medical unit, and in the following year he became deputy director. In 1939 he was appointed to the university chair of medicine at the school and director of the unit. In 1938 he was elected F.R.C.P., and in 1939 he delivered the Goulstonian lectures to the college on diabetes mellitus. Ten years later he chose the same subject for his Oliver-Sharpey lectures. Two years ago he delivered the Lowell lectures at Boston, Mass. His other published work includes many papers on the liver, including his description of toxipathic and trophopathic hepatitis. He has also investigated the use of thiouracil and in 1947 published, jointly, a comparison of its value with that of thyroidectomy in Graves's disease. Dr. Himsworth became a member of the Medical Research Council last year.

Congress of Obstetrics and Gynæcology

The organisers of the Twelfth British Congress of Obstetrics and Gynæcology, which is being held at Friends House, Euston Road, London, N.W.1, on July 6–8, are anxious to estimate as closely as possible how many people will be attending. It will be possible for members to register up to the first day of the congress, but it is hoped that all who intend to be present will inform the hon. secretaries, at 58, Queen Anne Street, W.1, as soon as they can. The cost of the Guildhall banquet on July 8 is 45*s*., payable on registration; applications for ladies' tickets should reach the hon. secretaries by June 20. For the sake of recently qualified doctors, house-officers, registrars, and ex-Service graduates an associate membership has been introduced, with a registration fee of 1 guinea. Associate members may attend all the congress meetings and receive the introducers' papers but may not attend the social functions.

Prof. Alan Moncrieff, director of the Institute of Child Health in the University of London, has recently visited Sweden at the invitation of the medical faculties to lecture in Stockholm, Uppsala, and Lund.

The North Persian Forces memorial medal for 1946 has been awarded to Dr. John McArthur for his paper on Malaria Transmission in Borneo (*Lancet*, 1946, ii, 117).

Appointments

FROOME, KENNETH, M.B. Lond.: pathologist, Scarborough and associated hospitals.

HENSON, R. A., M.D. Lond., M.R.C.P.: asst. physician, and asst. physician to department of neurology, London Hospital.

LODER, R. E., M.A., M.B. Camb., D.A.: specialist anæsthetist, Peterborough area.

MILLER, R. G., M.B. Edin., D.P.H.: divisional M.O., North-East Division, National Coal Board.

SALFIELD, D. J., M.D. Düsseldorf: asst. psychiatrist, Crichton Royal Mental Hospital, Dumfries.

WILSON, W. M., M.B. Edin., F.R.C.P.E.: asst. physician, Perthshire general hospitals.

Fulham Hospital:

BICKERTON, MARGARET, M.R.C.S.: house-surgeon.

TERESCHENKO, N. N., F.R.C.S.: senior surgical registrar.

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HISTORICAL BUILDING
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FEEDING OF PREMATURE BABIES

FINDLAY J. FORD
M.D. Glasg., F.R.F.P.S.
CONSULTING PÆDIATRICIAN, GLASGOW CORPORATION MATERNITY UNITS; ASSISTANT VISITING PHYSICIAN, ROYAL HOSPITAL FOR SICK CHILDREN, GLASGOW

PREMATURE babies are always difficult to feed, and since about 10% of all babies born alive are technically premature, weighing less than 2·5 kg. (5½ lb.) at birth (Crosse 1945, Stone 1945, McNeil 1946), the best way to feed them is an important problem. The commonly accepted routine of very frequent feeding requires a relatively large number of nurses. These are not available, and there is not likely to be any material reduction in the shortage of nurses for some time. The housing situation continues to compel an ever-increasing number of mothers to enter hospital for their confinement, so the number of premature babies in maternity units rises every year. In the Glasgow Corporation maternity units the live births increased from 5500 in 1945 to 6500 in 1946 and 7500 in 1947. The proportion of premature infants was 8% of the live births in each of these years, varying from 7 to 13% in different units, the actual numbers rising from 463 in 1945 to 618 in 1947. Many other premature babies, born at home, would be sent to hospital for a few weeks if it were possible to accept them; but, mainly because of the shortage of nurses, they have to be cared for at home. There a simple routine is essential, since shortage of domestic help is just as acute as that of nurses in hospital. If the feeding routine could be simplified, the care of the premature infant, whether nursed at home or in hospital, would become a relatively minor difficulty.

Expert opinions differ on several aspects of this feeding. The intervals between feeds, the composition of the food, the quantities to be offered at each feed, and the methods of giving it are all matters in which no uniform practice is followed. The most diverse opinions have been published about the caloric intake and the type of feeding which can be expected to be best for the baby. Since I could not find any comparable charts showing how infants of various degrees of maturity progress on different foods, I examined the records of premature babies on a routine of feeding which varied only as regards the food, and tried to discover if any particular food really yielded the best results.

Routine of Feeding

Reports published on the feeding of premature infants were reviewed by Mackay (1941), and more recent references to the subject have been made by Tow (1942), Barnes and Willson (1942), Field (1943), Crosse (1944), Mackay (1944), O'Reilly (1944), Stone (1945), and Gordon (1947). On the whole these workers recommend frequent feeds, as often as every two hours, with additional water between feeds. It is suggested, however, that, when tube-feeding is required, an interval of three hours is acceptable.

O'Reilly indicates that the need for smaller and more frequent feeds is decided by the baby's lack of energy, not by the capacity of its stomach.

Mackay thinks that the nurse should give extra water after, during, or between feeds according to how the baby takes it best. She says that her schedule is merely a guide, and that the nurse must use her judgment at each individual feed, and that experience and good judgment are very necessary in this matter.

Crosse agrees with this but disapproves of tube-feeding, which in her view should never be used to save the nurses' time.

Tow gives a schedule showing fourteen separate administrations of fluid in twenty-four hours on the thirtieth day.

Stone is exceptional in stating that an interval of less than three hours between feeds is rarely necessary or desirable, since regular periods of gastric repose are essential to normal progress.

Gordon's views are similar to those of Stone.

None of these writers discussed the procedure to be adopted when the nursing staff is at a minimum and has no experience or aptitude for the job.

No explanation of the necessity for frequent very small feeds has been found. They seem to be based on long-established custom and probably were unavoidable in the period which preceded the common use of rubber stomach-tubes. These frequent feeds are open to criticism because of the amount of nursing required and because of the frequent disturbance of the infant. The frequent handling is of considerable importance since, if a normal newborn baby requires twenty hours' sleep every day, the premature infant is liable to be deprived of essential rest mainly by the frequency and cumulative duration of feeding. It is difficult to see how all the feeds can be sucked by a feeble baby, and how all the other time-consuming disturbances for changing napkins, oiling, turning from side to side, and other nursing procedures can be superimposed without considerable intrusion on the twenty hours of rest. And there is general agreement that the less a premature baby is handled the better is its chance of survival.

If the total food and fluid for the day could be given in combination the babies would be disturbed less often and fewer nurses would be required. The routine adopted in this study has been to give the fluid for the day in suitable quantities at feeding-times every three hours. No water has been given at other times, and parenteral fluid has not been given except in a desperate endeavour to revive an apparently moribund child. The fluid requirement of the premature baby is therefore of prime importance in considering the size of the feed.

FLUID REQUIREMENT

It is generally accepted that a normal baby requires a fluid intake of 2½ fl. oz. (70 ml.) per lb. of body-weight a day, but the amount of fluid needed by premature babies has not been laid down.

Hess (1923) advised a fluid intake between an eighth and a sixth of the body-weight daily.

Gordon and Levine (1944) found that, in premature and full-time infants, reduction in the average levels of fluid intake from 170 to 130 ml. per kg. did not lower either their water balance or their loss through the fæces, skin, and lungs, but their urinary output fell considerably. Negative water balances and fever followed intakes of 74–85 ml. per kg. of body-weight.

Crosse (1944) suggested that a graded intake is advisable, rising from 1 fl. oz. (28 ml.) per lb. of birth weight daily at the third or fourth day to 3 or 3½ fl. oz. (85 or 99 ml.) per lb. of birth weight at the fourteenth day.

O'Reilly (1944) gave 1 fl. oz. per lb. of body-weight a day at the end of three days.

Tow's (1942) comment was that the amount of fluid taken in the first month is not at all important, and that the premature infant is not a balloon to be blown up.

Adams (1948) gave 150–200 ml. per kg. of body-weight in eight three-hourly feeds but did not mention the total fluid intake.

Many other pædiatricians have recommended routine administration of parenteral fluids, but without specifying the total quantity to be given.

Table I summarises the opinions cited above and shows that the adoption of a standard of 2½ fl. oz. (70 ml.) per lb. of body-weight a day in the present study supplied a greater quantity of fluid than is usually given by mouth. There has been no difficulty in giving these amounts, and the more vigorous infants have indicated, by crying for their feeds, that the previous meal had been disposed of. There has been neither unusual œdema nor dehydration fever, and no parenteral fluid

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TABLE I—SCHEMES OF ROUTINE FEEDING OF PREMATURE BABIES

Reference	Daily fluid intake	
	Ml. per kg.	Fl. oz. per lb.
Hess (1923)	125–166	2–2⅔
Gordon and Levine (1944)	130–170	2–2¾
Crosse (1944)	61–215	1–3½
O'Reilly (1944)	61	1
Adams (1948)	150–200	2½–3¼
Present series	154	2½

has been required. It has not yet been possible to observe by radiography the time needed for the stomach to empty.

EXCRETION OF EXCESS FLUID

It is pertinent at this point to consider briefly the premature infant's ability to dispose of any excess fluid ingested. Darrow et al. (1945) referred to the poor renal function of premature infants. Young et al. (1941) studying the secretion of urine, found that very young œdematous premature babies had higher blood-urea levels than non-œdematous ones, and that these high levels were probably due to low minute volumes. By using inulin they showed that glomerular filtration in premature babies was even lower than in the normal infant but varied widely with minute volume. They noted also that high blood-urea levels only occurred in infants when minute volumes were low, and they remarked that at this age a low urine output meant renal failure.

Thomson (1944) cited many other workers and gave figures showing that in the newborn the average daily volume of urine rises rapidly in the first week of life, as do the frequency of micturition and the urinary pH. These changes run parallel to the increasing fluid intake as the supply of breast-milk improves. At the same time there is a rapid fall in the specific gravity and in the levels of urea and chloride in the urine and of urea nitrogen in the blood. These changes are most marked in the first five days after birth. In other words, a proper fluid intake has a diuretic effect in the normal newborn infant. It seems reasonable to deduce that, if the necessary amount of fluid was given to the child on the first day of life, the kidneys could dispose of any excess, since there cannot possibly be many more nephrons available at five days than at one day of age.

In view of the conclusions of Young et al. (1941) that high blood-urea levels and low urine outputs in premature babies were associated with low minute volumes it seems logical to try to increase the minute volume. Irrespective of the number of nephrons present in the kidneys of the premature infant, the simplest method of doing this would be to increase the fluid intake. If the nephrons of a normal infant's kidneys are capable of a tenfold increase in output in the first five days of life (Thomson 1944), those of the premature infant could probably do more than is usually expected of them, and from the observations of Gordon and Levine (1944) they appear to be, in fact, quite efficient. Further, Gordon and Levine found that there was a reduced output of urine in premature babies when the intake of fluid was reduced from 170 to 130 ml. per kg. (from about 2¾ to 2 fl. oz. per lb.) of body-weight. It therefore seems that a fluid intake of 2½ fl. oz. (70 ml.) per lb. of body-weight not only is within the capabilities of the premature baby's fluid metabolism but also would be of advantage in keeping the blood-urea level normal. Clinical experience during the past ten years has shown that premature babies have no difficulty in dealing with the quanitites of fluid thus calculated and can do so certainly by the second or third day of life.

TABLE II—STOMACH CAPACITY OF INFANTS POST MORTEM

Birth weight		Age (days)	Capacity (ml.)	Size of feed	
(lb. oz.)	(kg.)			(fl. oz.)	(ml.)
2 8	1·13	S.B.	10	¾	21
2 9	1·16	6	15		
2 10	1·2	S.B.	10		
3 2	1·47	9	25	⅞	25
3 7	1·56	1	10	1	28
4 4	1·93	7	35	1¼	35
4 7	2	1	20		
4 13	2·18	6	25	1⅛	42
5 10	2·53	3	55	2½	70
6 0	2·72	2	45		
6 9	2·94	2	48		

S.B., stillbirth.

STOMACH CAPACITY

Before advocating larger feeds at longer intervals it is necessary to show that the stomach will hold larger quantities than those commonly advised. I have found only one original reference to the capacity of the stomach at birth. Scammon and Doyle (1920) estimated the physiological capacity of the stomach in the first ten days of life by test-weighing breast-fed babies of various birth weights. They commented on the sudden change in capacity at the age of four or five days, and on the discrepancy between the capacities they found in babies fed five times daily and the smaller capacities others had found in babies fed seven times daily. Their estimates of the physiological capacity resemble closely the average quantities of breast-milk secreted. They cited a few observations on the anatomical capacity post mortem, and added their own figures to those of various other workers who had likewise measured the anatomical capacity and thence derived the figures which have been passed on by writers on the subject ever since. The volumes for anatomical capacity are much smaller than those which the average newborn baby will readily suck from a bottle—e.g., the figure for a 7 lb. baby (3·2 kg.) is given as 35 ml., yet such a child often sucks 3 fl. oz. (85 ml.) of water in a single "feeding" within twelve hours of birth. For the present purpose it is worth noting that Scammon and Doyle (1920) gave the following figures for premature babies: birth weight 1·5–2 kg., stomach capacity 22 ml.; and birth weight 2–2·4 kg., stomach capacity 30 ml.

A few observations were made for me to check the value of measuring the stomach capacity post mortem. The pyloric end of the stomach was tied and the stomach was filled with water, which was then measured. The results are shown in table II. Since the stomach wall had lost its ante-mortem elasticity, the figures may be taken as well within the stomach capacity during life,

TABLE III—DAILY CALORIC REQUIREMENT OF PREMATURE BABIES

Reference	Calories daily	
	Per kg. of body-weight	Per lb. of body-weight
Tow (1942)	66–132	30–60
O'Reilly (1944)	88	40
Adams (1948)	94–121	43–55
Jorpes et al. (1946)	100	45
Talbot et al. (1922)	100–134	45–61
Talbot (1917)	102–170	46–77
Stone (1945)	110–120	50–54
Crosse (1945)	110–132	50–60
Gordon and Levine (1944)	Average of 120	54
Mackay (1944)	132	60
Mackay (1941)	100	45
Present series	110 by 4th day	50

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TABLE IV—FEEDS TO BE GIVEN TO PREMATURE BABIES FROM BIRTH

Birth weight (lb. oz.)	Birth weight (kg.)	Total daily fluid requirement (fl. oz.)	No. of feeds	Amount of each feed*	Total calories supplied daily
2 4	1	6	8	6 drachms	120
2 12	1·25	7	8	7 ,,	140
3 4	1·5	8	8	1 fl. oz.	160
3 12	1·75	9½	7	1½ ,,	210
4 8	2	11¼	7	1½–2 ,,	210–280
5 0	2·25	12½	7	2 ,,	280
5 8	2·5	14	5	2½ ,,	250

* Since the feeding-bottles are marked in ½ oz., the quantities in this column are given to the nearest ½ oz.

and are really no guide to the clinician except in comparison with the post-mortem capacity of normal infants.

Clinically it has been found that feeds of the size shown in the right-hand column of table II have been well tolerated. In almost every instance feeds were given by tube until the infant showed intolerance of the tube or began to suck while being tube-fed. Vomiting was very infrequent and led to immediate reduction, for a few feeds, of the quantity given. Post mortem it has been a great rarity for milk to be found in the bronchi, and even then it has been thought to be agonal and not a precipitating cause of death.

CALORIC REQUIREMENT

The caloric requirement of the premature infant has never been properly determined during the first few days of life, and it is unlikely that it ever will be, because of the fragility of the child. It is therefore impossible to cite a scientific assessment based on metabolic studies, and the published reports show a variation in estimates even wider than those expressed on fluid requirement. Most of the feeding schedules either ignore the first few days of life or allow a few calories to be given as a gesture in the right direction. Yet all agree that the premature child, if it is to survive and thrive, should have more calories per unit of weight than the normal baby needs.

Talbot (1917) stated that fat deposited in the last month of intra-uterine life is the storehouse of fuel in the first few days, and must be present in large enough amounts to supply energy until the breast-milk "comes in" to take its place. He also said that clinical experience bears out the inference that an infant without a good layer of fat at birth should receive food at the earliest moment, and that this is especially true of premature infants, which are almost entirely devoid of fat and should be fed at a very early hour to conserve their strength.

Talbot et al. (1922) studied the basal metabolism of seven premature babies weighing about 1·5 kg. They cited other published reports giving the requirement as 102–170 calories a day per kg. of body-weight. They pointed out that these relatively large amounts were required mainly for growth, since the basal metabolism was low and there was little muscular activity in such infants.

More recently Gordon and Levine (1944), from metabolic studies in healthy premature babies more than two weeks old, have estimated the caloric need at a mean of 120 a day per kg. of body-weight. Gordon (1947) suggested that a schedule calculated to give the fluid requirement by the third day of life and the caloric requirement by the fifth day is a most suitable arrangement.

Mackay (1941) proposed an intake of 53 calories a day per lb. of birth weight in the second week but cited other authorities whose practice was to give 100 calories a day by the fifth to eighteenth day. In a later paper (Mackay 1944) she favoured 60 calories a day per lb. of body-weight and outlined a scheme for starting with a seventh of the quantity on the first day and increasing daily by a seventh to reach the full quantity at the end of a week.

Crosse (1945) thought that an average of 50–60 calories a day per lb. of body-weight was needed if premature infants were to gain weight satisfactorily, but that these values should only be reached by the end of the second week of life.

O'Reilly (1944) stated that babies start gaining on 40 calories a day per lb. of body-weight, and that this intake should be reached by the fifth or sixth day by those weighing more than 4½ lb., and by the seventh or eighth day by those weighing less than 4½ lb.

Stone (1945) gave 110–120 calories a day per kg. of body-weight as the optimal intake but said it is often wise to work up to this range deliberately while the digestive capacity of the child is being observed.

Jorpes et al. (1946) gave 100 calories a day per kg. of body-weight and started feeding early.

Adams (1948) supplied about 43–55 calories a day per lb. of body-weight but gave no detailed information about the feeding schedule.

It is apparent that there is considerable difference of opinion about what calorie intake is needed (table III) and when it should be given in full. The danger of digestive upset from overfeeding is unanimously emphasised, yet no adjustment seems to be made for infants of different weights, a uniform allowance of calories per unit of weight being made. But premature babies cannot all have the same metabolic requirements, since some are smaller than others. Fleming (1924) has shown graphically how the requirements of malnourished babies, including premature ones, vary with their degree of malnutrition. Some so-called premature infants are in fact born at term. Their food requirements can be calculated with propriety from Fleming's graph and if such a child weighed 1·25 kg. (2¾ lb.) it would need 205 calories a day, whereas if it weighed 2·5 kg. (5½ lb.) the requirement would be 307 calories. The smaller baby would be given 164 calories per kg. (74 calories per lb.) daily and the larger one only 123 per kg. (56 per lb.). It follows that, if a uniform allowance based only on body-weight is made, either the bigger babies will be overfed or the smaller ones starved. The scale of allowances should be graded so that the smaller premature babies will receive much more and the larger ones little more, than the daily allowance of 100 calories per kg.

TABLE V—CALORIE AND FLUID INTAKE OF BABY SHOWN IN FIG. 2

Day of life	Calories		Fluid	
	Per kg.	Per lb.	Ml. per kg.	Fl. oz. per lb.
1	..	..	154	2½
2	59	27	154	2½
3	88	40	154	2½
4	118	54	154	2½
15	125	57	186	3
19	131	59	186	3
22	170	77	237	3¾
35	210	96	294	4¾
42	140	64	200	3½ + water between feeds

(45 per lb.) of body-weight allotted to normal infants. Table V shows that the published estimates of caloric requirement already reviewed are much too modest after the first three or four weeks.

In view of the facts that premature infants have very little store of food in their bodies, and that the more premature they are the more urgent is the need to supply them with a basic allowance of calories, it seems that food is essential from the first day of life if they are to survive. The greater the degree of prematurity the greater will be the need for a fairly adequate feed at the earliest possible moment.

PRESENT RÉGIME

Table IV shows the quantities of food prescribed for premature infants in the Glasgow Corporation maternity units. Eight feeds daily indicates that the child is fed

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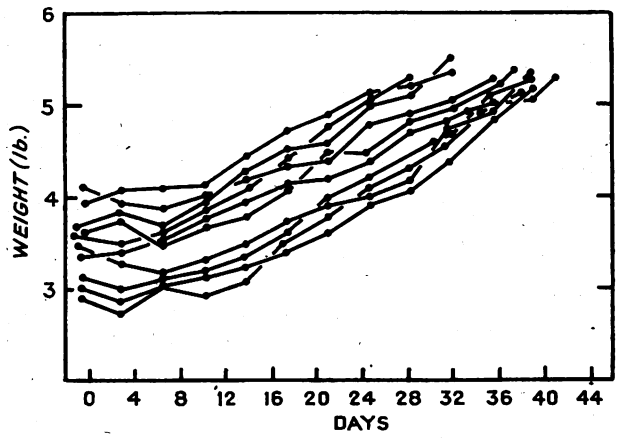

Fig. 1—Weight curves of 10 premature babies fed on breast-milk.

every three hours, day and night. When seven feeds are ordered, the early morning one of the three-hourly schedule is omitted. The nurse is instructed to find from the table what quantity is to be given at each feeding and the number of feeds in the day. As soon as possible after birth, when breathing is properly established and the baby properly heated and rested, the feeding régime is started. For the first twelve hours the prescribed amount is given as water. During this period the capacity of the stomach can be assessed, and if the volume of the feed seems too large it can be reduced. In the second twelve hours the fluid, adjusted in volume if necessary, is given as half milk, half water. On the second day the strength of the feed is increased to two-thirds milk, and on the third or fourth day to undiluted milk. If the infant is able to suck strongly it is allowed to take what it can within 20 min. If the child is feeble or sucks poorly it is tube-fed from birth.

It is a simple matter for a relatively inexperienced nurse to follow this routine, and the doctor is assured that the child is having an adequate fluid intake and a fair amount of nourishment. If, at consecutive weighings every two or three days, the weight falls steadily on this régime, it may be assumed that the infant has an infection, usually respiratory, and is in need of the appropriate treatment, and that the fault does not lie in insufficiency of fluid or caloric intake.

The milk used is referred to below. At the moment it is sufficient to say that the calorie values of all milks used have been adjusted to about 20 calories per fl. oz. There has been no trouble from digestive upset except in the presence of infection. There has been no unusual amount of œdema. The weight curves have been satisfactory (figs. 1–4).

Fig. 1 shows the weight curves of 10 infants weighing less than $4^1/_4$ lb. at birth. There were 14 such babies born in one of the units in the first six months of 1948: 2 lived for only a few minutes, and 2 others for less than a day. The weight curves of the remaining 10 show the progress which may be expected on breast-milk feeding in the absence of infection.

The indication for subsequent increase in the feed has generally been the baby's weight. When the child gained enough to put it in a higher grade in the feeding-table, the feed automatically increased to the corresponding amount; but, if the baby seemed dissatisfied, if the weight increase slowed, or if the stools decreased from the average of three or four daily to one or two, the feed was increased experimentally. The progress of a typical healthy baby is shown in fig. 2. Some premature babies, after the first two weeks, can take, and often demand, far more than the quantities stipulated above, but these feeds are intended for use at birth and have proved very satisfactory as a starting-point, which is otherwise difficult to determine.

The calorie and fluid intakes of the baby whose weight is recorded in fig. 2 are shown in table V. The drop in intake on the forty-second day was due to the change, preparatory to dismissal, from a three-hourly to a four-hourly schedule and to the nurses' reluctance to give the child a larger quantity at each feed. This change of routine is customary so that the mother may have an undisturbed night's rest when she takes the baby home. For ease in feeding at home, when the mother has no breast-milk, all babies on reaching $5^1/_2$ lb. are given half-cream National dried milk with added sugar, and before dismissal the quantities are adjusted so that the child's progress shall not be interrupted.

The general results of this method of feeding are shown in tables VI and VII. The fate of the premature baby is influenced by so many factors that it is difficult to assess the individual importance of each one; but, if infection can be kept at a very low level, as in the children referred to in table VII, good results very largely depend on efficient feeding. For comparison with this series the figures given by Crosse (1945) for Birmingham—a comparable community—are included.

Two of the six units in which the present study was made enjoy advantages not shared by the other four. A striking feature in these two units is almost complete freedom from infection in the nurseries for premature babies. The results in these two units are shown in table VII.

SUMMARY

The schedules previously published by other workers for feeding premature infants are summarised and commented on.

It is suggested that the frequency of handling the babies and the amount of nursing care needed could with advantage be reduced. With this in mind the fluid requirement, gastric capacity, and caloric needs of the premature baby are considered.

A simplified routine, which can be carried out by any competent though inexperienced nurse, is described. The routine is based on a standard daily fluid intake, from birth, of $2^1/_2$ fl. oz. given at first as water but by the fourth day as milk supplying about 20 calories per fl. oz. No additional fluid is given either by mouth or parenterally.

Examples of results achieved are given.

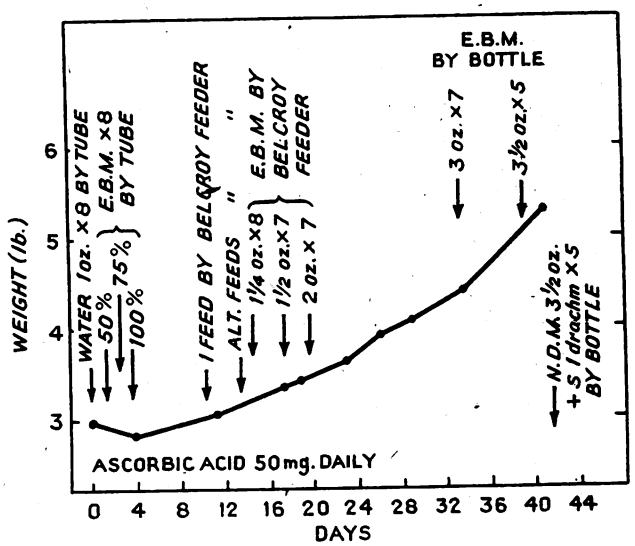

Fig. 2—Weight curve of small healthy baby on feeding régime recommended: E.B.M., exhausted breast-milk; N.D.M., National dried milk. (For calorie and fluid intake see table V.)

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Type of Food

It is generally, though not universally, accepted that breast-milk is the ideal food for premature babies. Milk banks were established mainly to ensure a permanent supply for these infants. But many hospitals have no such reserve, and nursing-homes and private individuals generally cannot readily arrange for a supply at short notice, if at all. When breast-milk can be obtained from a milk bank it is expensive in money, and when the bank is part of a hospital's activity it is expensive in nurses' time. It is therefore essential to find out if breast-milk is really so advantageous as to justify the financial outlay and the use of valuable nursing-hours in collecting and processing it. It is equally important to discover the most suitable substitute for breast-milk in feeding the premature baby.

Gordon and Levine (1944) have doubted whether breast-milk is the ideal food for premature babies. Studying the metabolic basis for the feeding of infants, they tried feeds of breast-milk, whole cow's milk, and milk mixture in which olive oil took the place of butter fat. The fæcal loss of fat was much greater in premature than in full-term babies. Qualitative alterations in dietary fat had no effect on the large amount of fæcal fat of premature babies. These workers therefore suggested that "premature babies which do not gain weight on calorie intakes of 120 per kg. fail to do so because of excessive loss of calories as fæcal fat, and that in such circumstances the calories need not be increased but the fat intake should be reduced."

TABLE VI—FATE OF PREMATURE INFANTS IN 1945–47 INCLUSIVE

Birth weight (lb.)	Number	Died	Dismissed at 5½ lb.
Under 3½ (1·5 kg.) ..	280	239	41 (*15%*)
3½–4½ (1·5–2 kg.) ..	457	176	281 (*61%*)
4½–5½ (2–2·5 kg.) ..	904	173	731 (*80%*)
Total	1641	588	1053 (*64%*)
Crosse (1936–43) ..	1881	658	1223 (*65%*)

The ability of the premature baby to absorb and retain nitrogen was highly efficient. It was absorbed just as well from cow's milk as from human milk, and raising the amount of protein from 2·8 to 4·7 g. per kg. of body-weight did not lower the coefficient of digestibility. About 90% was absorbed at each level of intake—i.e., well within the absorption range of adults. The nitrogen balance of premature babies given about 5 g. of protein per kg. was three times that of older full-term infants. Gordon and Levine thought this had a relationship to their increased rate of growth. Carbohydrate, judged by the respiratory coefficient, was easily utilised. They expressed the opinion that human milk has too little calcium, phosphorus, and nitrogen to cover the increased needs of premature infants, which have low stores of minerals at birth and an abnormal rate of growth.

Jorpes et al. (1946) stated that, when the calories required by premature babies are supplied solely by breast-milk, not only the capacity of the stomach but also the whole digestive system is strained, though they did not give reasons for this statement. To increase the caloric intake without adding much to the bulk of the feed they added to breast-milk a casein hydrolysate and glucose. In most of the 100 infants discussed the daily dose of casein hydrolysate was 2·5 g. per kg. of body-weight, with an equal amount of glucose. This was well tolerated. There was no digestive upset, and in every instance there was a distinctly higher gain of weight than on breast-milk alone.

Gordon and Levine (1944) also gave feeds of high protein content—5 g. or more per kg. of body-weight—and found that amino-acids appeared in the urine. The amount of these intermediate products varied directly with the intake of phenylalanine and tyrosine. These were not present in the urine of full-term infants but could be produced by a single large dose of either amino-acid. Though in premature babies all the fractions of vitamin-B complex were ineffective in correcting the defective metabolism responsible, 100–500 mg. of ascorbic acid produced a dramatic disappearance of the abnormal products, often with a significant rise in extracellular ascorbic acid. Gordon and Levine concluded that ascorbic acid should be added to the diet of premature infants shortly after birth.

TABLE VII—FATE OF PREMATURE INFANTS IN TWO SPECIAL UNITS, 1946–47

Birth weight (lb.)	Number	Died	Dismissed at 5½ lb.
Under 3½ (1·5 kg.) ..	36	22	14 (*39%*)
3½–4½ (1·5–2 kg.) ..	64	2	62 (*97%*)
4½–5½ (2–2·5 kg.) ..	177	11	166 (*94%*)
Total	277	35	242 (*87%*)
Crosse (special unit 1931–43)	827	106	721 (*87·2%*)

Darrow et al. (1945) noted that feeding premature infants on milks containing up to 7 g. of protein per 100 ml. was liable to produce acidosis, as shown by a low pH, low plasma-bicarbonate and, usually, high plasma-chloride levels, and sometimes air-hunger. This could be prevented by adding sodium bicarbonate to the milk powder. They remarked that the susceptibility of these infants to small changes in the intake of sodium and chloride must probably be taken into account when modified milks are used for premature and young infants.

Since the present paper was first drafted, Adams (1948) has reported a series of babies fed on equal parts of evaporated full-cream milk and water, without additional carbohydrate. The weight curves of these infants show their progress on what was to all intents and purposes the equivalent of full-cream cow's milk. Adams states that, apart from their having an average of five stools a day, there was no evidence of intolerance of the amount of fat thus given.

It appears from the foregoing studies that premature babies may not digest fat well, but that they absorb carbohydrate readily and digest protein well, provided it is not present in excessive proportions, higher than those found in unmodified human and cow's milk. It is also apparent that, when either human or cow's milk is modified, care must be taken to avoid metabolic upset.

CLINICAL COMPARISON OF DIFFERENT FEEDS

An attempt was made to design a clinical test of progress on various feeds so that as many variables as possible would be eliminated. One of the smaller maternity units was chosen for the purpose. The nursing staff was small, accustomed to the routine already described, and seemed likely to remain in the hospital for the necessary time, thereby ensuring a constant standard of nursing. The babies were given breast-milk whenever possible, but if at the time of birth no breast-milk was available the child was given one of three artificial feeds. If the mother subsequently secreted enough breast-milk to make it probable that she could breast-feed her child, the baby was taken off its artificial feed and given the breast-milk. Such infants were not included in the study, because their progress would be inconclusive. The type of artificial food was changed at six-month intervals over a period of eighteen months, thus giving a series of figures for three different foods. The breast-milk figures were obtained throughout the whole period.

Despite the criticisms of breast-milk, the present study was based on the assumption that it is the ideal food for the newborn premature baby. Therefore, since breast-milk has a calorie value of about 20 per fl. oz. (Mackay 1941), this was taken as the standard to which the calorie value of the artificial feeds should aspire. Table VIII shows that the four feeds used were not of exactly equal calorie value; but, with the small feeds required, the difference between highest and lowest daily intake could not exceed 50 calories.

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TABLE VIII—COMPOSITION OF THE FOUR FEEDS USED (G. PER 100 ML.)

Feed	Lact-albumin	Casein	Total protein	Fat	Carbo-hydrate	Salts	Calories per 100 ml.
Breast-milk ..	0·4	0·9	1·3	3·5	6·5	0·2	63·5
Carnation milk	0·5	2·4	2·9	3·1	7·5	0·6	72·0
Ostermilk no. 1	0·7	1·4	2·1	2·5	7·0	0·5	60·0
Trufood ..	0·6	0·8	1·4	3·4	6·25	0·65	63·0

The three artificial foods used were 'Carnation Milk,' 'Ostermilk No. 1,' and 'Humanised Trufood.' The first is an unsweetened evaporated full-cream milk and was used in a dilution of 1 part of milk to 2 parts of water, with about 1 g. of lactose added to each fluid ounce of the mixture. Evaporated milks of similar nature are widely used in the U.S.A. Ostermilk no. 1 is a modified sweetened half-cream milk which has for many years enjoyed great popularity in Britain for the artificial feeding of small babies. Trufood is the result of an ambitious effort to counterfeit breast-milk and has been widely believed to be specially suitable for feeble infants. The composition of each of these four feeds is shown in table VIII.

The following figures refer to all the babies, except those already mentioned, which lived for more than 72 hours, whether the ultimate result was good or bad—a total of 86 babies. During the investigation 5 babies died of congenital abnormality or of infection after having made a propitious start in life, and they are included in the records submitted here. There was no selection of babies in any way other than the requirement of survival beyond the third day of life. The numbers for each different type of feeding are unequal because of the variation in the total number of premature babies in the three six-month periods and because of the fluctuation in the proportion which could be fed on breast-milk. The distribution is shown in table IX.

It is impracticable to publish the 86 individual charts; but, when the weight curves for the four types of feed were arranged according to the birth weights, the general trend could be seen (fig. 3). Some of the curves tend to fall away as age increases. This is due to the dismissal from hospital of the babies which were thriving best, leaving only the slower infants to continue under observation.

It is obvious that there was no striking advantage to be gained from the use of any one of these four feeds. In all three weight groups it can be readily seen that on breast-milk the babies had a smaller initial weight loss and began to gain weight more quickly than on the other feeds. This weight increase was so rapid in the group of infants weighing more than 5 lb. that, to enable the children to attain the arbitrary dismissal weight of 5·5 lb., their stay in hospital was only two weeks, compared with the three weeks required on any of the other feeds. But in the end this advantage was not maintained, and the artificially fed babies gained weight just as quickly after the first ten days as did those fed on breast-milk.

There did not seem to be any great advantage in using dried milks specially prepared for infants, since the curves for the babies fed on diluted evaporated full-cream milk show that their progress was equally rapid.

Clinically there was no difference in the appearance of the children, in the frequency of vomiting, in the normality of the bowel movements, or in the enthusiasm with which the feeds were taken. The nurses were inclined to favour the evaporated milk because of the consistence of the stools produced on this type of feeding, but I could not have guessed from inspection of the fæces which artificial food was being given.

The removal, processing, and storing of breast-milk entail a great deal of work, time, and care, and it is therefore difficult to rouse in overworked nurses any enthusiasm for breast-milk feeding. The beneficial effect of breast-milk feeding in accelerating the desired rise in the weight curve must, however, be kept in mind. A liquid milk preparation is easier to handle than a milk powder, and the nurses' preference for evaporated milk may well be connected with this observation.

DISCUSSION

Mention was made earlier in this paper of a distinct tendency in recent years to decry breast-milk, and of attempts to improve it by additions to the protein and sugar content. Jorpes et al. (1946) published figures showing that when a casein hydrolysate and glucose were added to breast-milk there was a well-marked increase in the rate of gain in weight. It is pertinent to compare the most impressive curve of their series with the curve (fig. 4) of a baby of almost identical weight in the present series, and with the average curve for the group of smallest premature babies fed on breast-milk. This chart suggests that there is no special advantage to be gained from that modification of breast-milk.

TABLE IX—DISTRIBUTION OF BABIES

Feed	Birth weight (lb.)			Total
	Over 5	4–5	Less than 4	
Breast-milk ..	17	5	10	32
Carnation milk ..	7 (1)	10	6 (2)	23 (3)
Ostermilk no. 1 ..	9	7	5	21
Trufood	4	4 (1)	2 (1)	10 (2)
Total ..	37 (1)	26 (1)	23 (3)	86 (5)

Figures in parentheses indicate deaths.

The feeding schedules of Jorpes et al. aimed at an intake of 100 calories per kg. of body-weight on unmodified breast-milk In the present study similar small babies started on 120 calories per kg. of body-weight. Possibly the more rapid increase in weight of the babies fed on modified breast-milk is attributable to the increase in caloric intake and not necessarily to any intrinsic benefit conferred by the protein digest and glucose. At any rate, breast-milk in the ratio of 2·5 fl. oz. per lb. (70 ml. per kg.) of birth weight seems in most premature babies to be just as efficacious as breast-milk thus modified. The same applies to the artificial feeds, since no material difference was found between the progress of babies fed on diluted evaporated milk and those fed on the highly modified "baby foods." If that point is well founded, it seems needless to expend time and skill on the preparation of any of these specially designed foods—modified breast-milk or either of the specially designed infant foods used in this test—when comparable results can be obtained by using unmodified breast-milk or diluted evaporated cow's milk.

From the clinical point of view the choice of a food suitable for the nutrition of premature babies at birth seems to resolve itself simply into the choice between breast-milk and diluted cow's milk; and there does not appear to be much doubt about which should be chosen. Even if the possible transference of immune bodies from mother to baby and the emotional effects on the mother are ignored there is, besides its cheapness, an important advantage to be gained from breast-milk feeding. The sooner the child can be induced to gain weight the earlier will it be removed from the abnormally great risks to which its diminutive size and feebleness expose it, and it is precisely in this respect that breast-milk is superior to any of the other feeds which were tried. Table IX shows that this is not wholly attributable

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to the calorie value of the breast-milk, which did not supply the greatest calorie intake of the four feeds under trial. This observation alone would go far to decide which type of feed should be chosen.

Consequently it seems worth considering, when pooled breast-milk is not overabundant, whether the wisest use might not be made of it by reserving the supplies for the first ten days of the premature baby's life. Thereafter a change to artificial food, though not ideal, seems to have little influence on the rate of weight increase.

If breast-milk cannot be obtained, there is a wide range of milk preparations from which a substitute can be chosen. For general use liquid milk is unsafe, and in recent years it has been the official policy in Britain to supply for babies half-cream or full-cream dried milks. These are roller-dried, and on being reconstituted have a layer of fat on top. In the stomach they tend to form large curds and therefore do not seem to be, theoretically, the most desirable food for premature babies. The bigger babies certainly do well on them, and it is my practice to dismiss from hospital all artificially fed babies, including the premature ones, on half-cream National dried milk. This is largely for the convenience of the mothers, who can always obtain the milk from the Government food offices but may have difficulty in obtaining liquid milk or a proprietary dried milk. The latter have the same disadvantages as National dried milk and, being modified in various ways and not subsidised, are more expensive. Yet even the smallest premature babies of this study throve on one of these theoretically less suitable milks—ostermilk no. 1.

In America most of the preserved milks used for infant feeding are evaporated. The processing alters the character of the milk so that it is easily mixed with water and does not form large curds in the stomach. McCulloch (1944) has used nothing but evaporated milk for some years, and claims highly satisfactory results in premature babies, though he gives no figures or charts to support his contention. Adams's (1948) report is equally favourable and confirmed by weight charts very similar to those of the present series. These two workers agree with the opinion already expressed here that there is no need for an elaborate preparation to be chosen as a substitute for breast-milk.

Very few spray-dried milks are obtainable in Britain. They possess the advantages of evaporated milks, being evaporated before being dried. The spray-dried milk used in the present study, trufood, gave good results,

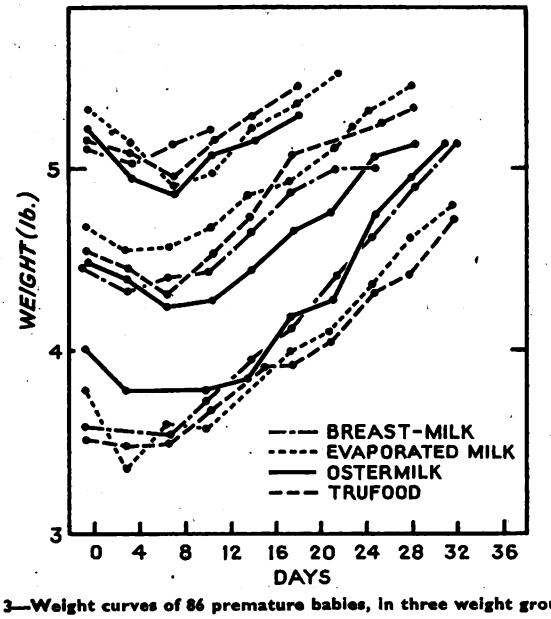

Fig. 3—Weight curves of 86 premature babies, in three weight groups.

but its composition has been so much modified that the theoretical advantage of spray-drying is undetectable, and no critical comparison can be made with the other, roller-dried, preparation.

There is widespread belief that, for infant feeding, evaporated milks are potentially more dangerous than dried milks because of an increased risk of infection after the container has been opened. I have not found any report published concerning this; but, since dried milks have an expiry date marked on the package and

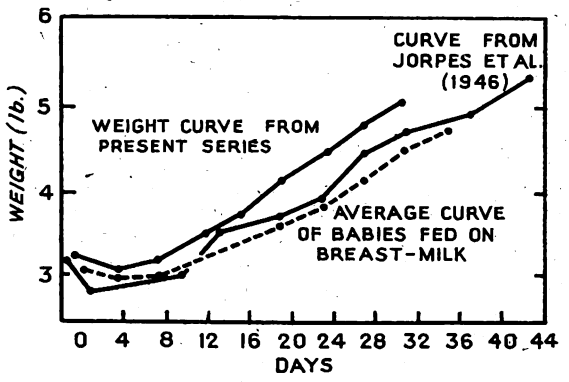

Fig. 4—Best weight curve on modified breast-milk in series of Jorpes et al. (1946) compared with curve of similar baby and with average curve of smallest babies in present series.

evaporated milks have not, one must assume that dried milks deteriorate, presumably because of bacterial action. In institutions, where a tin of evaporated milk can be used in one day, the risk of infection must be very small and, where there is a refrigerator, practically absent. In a private house, where there is only one baby being fed, the risk is greater but probably not more than is run in using a relatively large tin of dried (not really dry) milk which is opened seven or eight times daily and takes one or two weeks to be consumed. The product of a breast-milk bank is, as regards infection, open to precisely the same criticism as evaporated cow's milk.

If the foregoing arguments are accepted, the choice of an artificial food for the premature baby, when breast-milk is not obtainable, can be narrowed to a dried or evaporated unmodified milk. And, because of the alteration in the milk caused by long heating, either a spray-dried or an evaporated milk would have some theoretical advantage over roller-dried milk. Since I know of no spray-dried unmodified milk, the choice is narrowed further to evaporated or (what is much the same) liquid milk subjected to long boiling in a water-bath as the nearest approach to ideal in suitability, for the infant, relative simplicity of manufacture, duration of "keeping" qualities, and ease of preparation at feed-time. Any of the numerous "baby foods" will give good results, provided care is taken to ensure a sufficient intake of calories, but they suffer from two disadvantages: the cost of the various additions to and subtractions from their ingredients, and their being subject to an expiry date for safe use—an important point in rural practice.

There remains the question of expense. In hospitals with a milk bank there is no great financial outlay in feeding the premature baby on breast-milk. In nursing-homes or private houses it is very expensive, even though it may be necessary to buy the breast-milk only for the all-important first week. In very many instances this may be impossible, financially or geographically, since the child may be born to poor parents or in an inaccessible locality. A dried or evaporated milk preparation is relatively easy to buy and relatively cheap. From the results shown here it seems unnecessary

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to go to any great lengths in an endeavour to arrange for breast-milk till the mother's own supply develops. But, if a reasonable outlay of money and trouble will procure enough to feed the baby until then, the parents can be assured that the outlay is to the child's advantage. If the expense or difficulty is considerable, then efficient and relatively inexpensive substitutes can certainly be obtained locally.

The administration of vitamins to premature babies has not so far been mentioned. There is no doubt about the need for a very liberal supply of vitamins A and D at a very early age; and, in view of the observations of Gordon and Levine (1944) on protein metabolism, there may well be considerable benefit from the administration of vitamin C also. It is my practice to give 50 mg. of ascorbic acid daily from the age of two or three days and continue it indefinitely. The daily quota of vitamins A and D is not begun until the child is clearly making progress, and usually not until it has begun to suck and swallow properly. No steps have been taken to give routinely any of the B-complex vitamins, because no beneficial effects from these in premature babies have been reported and trials of some of the dried preparations have not shown any benefit that I could detect.

SUMMARY

Recent reports on the metabolism of food in premature infants are briefly reviewed. The criticism of breast-milk in relation to their feeding and the modifications of human and cow's milk designed to improve their nutritive value are noted.

A clinical test has been made of the relative values of breast-milk, two modified cow's-milk preparations, and an evaporated milk. The subjects of the test were 86 premature babies. Those fed on breast-milk had a smaller initial weight loss and began to gain weight sooner than those fed otherwise. After the first ten days the weight curves were similar on all four types of feeding.

The breast-fed babies of this study are compared with babies fed on modified breast-milk (Jorpes et al. 1946). It is suggested that unmodified breast-milk, when given in adequate amount, is all that is required; and that when breast-milk is not obtainable an unmodified cow's-milk substitute is just as satisfactory as elaborately prepared "baby foods."

The milk preparations available are commented on and reasons given for a bias in favour of evaporated milk for premature babies.

The general conclusion is that breast-milk is the food of choice for premature infants, especially in the first seven to ten days of life; but when this cannot be obtained the babies will thrive on any of the ordinary substitutes, provided these supply an equivalent number of calories (about 20 per fl. oz.), given in the proportion of $2^1/_2$ fl. oz. per lb. of body-weight a day, in three-hourly feeds, without additional fluid by mouth or otherwise.

I wish to thank Sister M. I. Allan for the great care which she and her nurses took of the babies during the long period of this study; Dr. Stuart Laidlaw, medical officer of health, Glasgow, for permission to publish these observations; and Prof. Stanley Graham for his helpful criticism of this paper.

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TESTICULAR PAIN

ITS SIGNIFICANCE AND LOCALISATION

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"False facts are highly injurious to the progress of science, for they often endure long; but false views, if supported by some evidence, do little harm, for everyone takes a salutary pleasure in proving their falseness."—Charles Darwin: *The Descent of Man.*

MANY statements have been published that in certain urogenital disorders normal testicular sensation is present or absent, or that the testis is painful and/or tender. Sometimes it is stated that pain is referred *to* the testis, whereas in other cases pain is said to be referred *from* the testis. If these statements mean, as they seem to, that testicular sensation is located within the scrotum, they betray a tendency to ignore basic anatomical and physiological facts and to accept, uncritically, some ingenious but ill-founded theories.

RENAL PAIN AND THE TESTIS

Cope (1946) writes: "When a patient complains of loin pain radiating to the corresponding testis one remembers the embryological fact that the testis is developed in the same region as the kidney; and though the former travels to the scrotum just before birth, yet in suffering it shows its sympathy with, and serves as an indicator for, the intra-abdominal structure which was developed near it." Should one not also remember that the ovary is developed in the same region as the kidney, that the segmental nerve-supply of the ovary is identical with that of the testis, and that women have the same kinds of urological diseases as do men? Strange, therefore, is it not, that renal pain should be referred or radiated to the testis and not to the ovary? If not to the ovary, why to the testis? Would Cope and his fellow theorists have us believe that the ovary is less "sympathetic" than the testis to the sufferings of the kidney? Fortunately for the reputation of the female gonad, there is no truth in the harrowing suggestion that Ovary forgets, while Testis remembers (with sympathy), the close though temporary association which both enjoyed with their near neighbours, the Kidneys, in the good old embryonic days.

The simple and logical truth is that renal pain is not referred to either the testis or the ovary.

LOCALISATION OF PAIN

It has been said that two types of pain may arise from injury to the testis: local pain, from slight trauma, and pain in the loin from more severe trauma. This implies that a specific cerebral centre may project pain at one time to a certain site and at another time to an entirely different site. I think physiologists will agree that this is inherently impossible.

True testicular pain is no more located within the scrotum than appendicular pain is located in the right iliac fossa.

In 1942 I first put forward the view (which I had the temerity to call a law) that "sensations produced in

DR. FORD: REFERENCES—*continued*

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tissues which have been developmentally or artificially displaced from their primary relative positions and which retain only their original innervation are invariably localised in the respective primary relative positions of those tissues" (Brown 1942). Before discussing some recent experiments and observations which seem to support my hypothesis, it will be well to refer briefly to the background which excited and stimulated my interest in, and which has a bearing on, the problem—i.e., why pain is so often localised in a position distant from the tissue in which it is produced.

According to Tastevin (1937) "the inversion of the sensations produced in two crossed fingers was observed for the first time by Czermak" (1855). But Aristotle (384–322 B.C.) asked the question: why is it that an object which is held between two crossed fingers appears to be two? The logical answer is clearly indicated in fig. 1.

Hurst (1939), in a paper on the nature and localisation of visceral pain, wrote:

> "When a loose fold of skin in an emaciated patient is pulled three or four inches to one side and then pinched, the pinch is felt in the normal position of the skin and not in its temporary position. The mobile viscera react in a very similar manner, as they are not connected with the skeleton by a rigid limb. Consequently the localisation of pain is very approximate and, though constant for each organ, it does not bear any close relationship with its true position, which varies with posture and many other conditions. On the other hand, localisation of pain in fixed organs is fairly accurate, but when they are displaced owing to some developmental abnormality, or as a result of disease, there is no corresponding shift in the localisation of the pain."

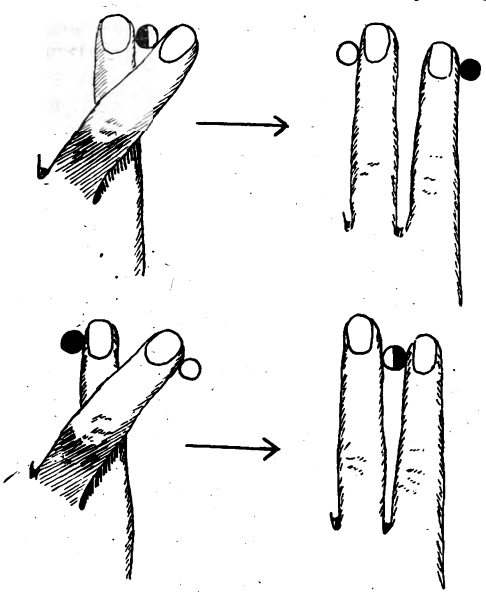

Fig. 1—Aristotle's question: why does an object held between two crossed fingers appear to be two? The illusion is produced because the crossed fingers appear to be parallel—their normal position. The converse also occurs—i.e., two objects are perceived as one.

From the context of this paper and his subsequent writings it is evident that Hurst did not grasp the full significance of his observations; nor would he agree (personal communications) with my view that there is no corresponding shift in the localisation of pain when *healthy* tissues are displaced in the course of *normal* development. Here one might ask what possible difference it can make to that part of the brain which is responsible for localisation of pain whether the particular tissue in which pain is produced is mobile or fixed; is located (e.g., the appendix) in the right iliac fossa, the right hypochondrium, or the pelvis; or whether it (e.g., the testis) remains in the abdomen, is arrested in the inguinal canal, or descends to the scrotum—if the innervation of that tissue has been acquired (and remains constant) and contact has been established with the relative cerebral centre before migration begins.

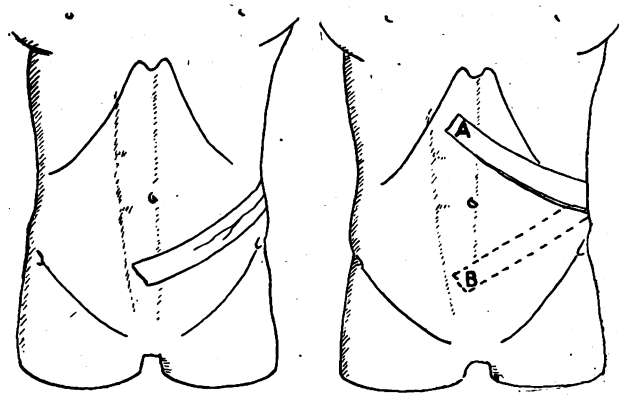

Fig. 2—Localisation of pain produced in transposed skin: A, site of stimulus; B, site of pain.

I am well aware that many physiologists, particularly those with little or no clinical experience, believe with Adrian (1947) "that there is a convergence of pain pathways from the surface and the interior" and "that deep pains are referred to the skin of the corresponding spinal segment." Adrian states categorically: "The brain has built up a detailed reference map of the body surface. The deep structures are not represented in this map. Therefore if a pain message from them shares some of the pathways from the skin, its place in the map will be referred to the skin."

I am in complete agreement with Morley (1931) when he writes: "I am firmly convinced that true visceral pain exists.... It is in no sense referred to the superficial structures of the abdominal wall, and is a deep-seated pain."

The observations of Wolf and Wolff (1943) on a patient with a permanent gastric fistula amply confirm Morley's conviction. They found that stimulation of the hyperæmic gastric mucosa readily induced pain which was unaccompanied by superficial hyperæsthesia or hyperalgesia. I have attended many doctors and medical students with intestinal or testicular or ovarian disorders, and all have told me that their pain was deep-seated and not in the skin. I have never been able to *elicit* cutaneous hyperæsthesia as a sign of pure visceral disease, though I can at times *solicit* it as well as anybody. Does the physiologist *never* suffer from deep-seated pain? I have heard it said that physiologists do not speak the same language as clinicians; but it is hard to believe their visceral sensitivity is all that different.

LOCALISATION OF PAIN PRODUCED IN TRANSPOSED SKIN

When a large portion of skin is needed to cover a denuded area, a pedicle graft is generally used. It occurred to me that interesting and informative observations could be made in such cases about the exact localisation of pain evoked in the distal part of the skin flap during the second stage of the operation—i.e., after transposition and before the pedicle is severed (fig. 2). It is essential that the afferent nerve-supply of the transposed skin be preserved. When a large graft is necessary, the donor skin is taken from the anterior abdominal wall. If the flap is cut obliquely downwards and medially, as is generally done, the greater part of the skin towards the distal end will be deprived of its nerve-supply. If, however, the incisions outlining the flap are made more horizontally (parallel with the cutaneous nerves) the innervation will be retained and practically all the skin which is to be transposed will remain sensitive to stimulation. This simple experiment—an elaboration of Aristotle's, Hurst's, and Czermak's observations—proved that pain caused by pinprick in the transposed

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skin was accurately localised by the blindfolded patient in the original site of the skin and not in the new position.

I acknowledge with gratitude personal communications from Prof. T. P. Kilner and his assistants, Dr. D. A. Kernahan and Mr. J. North, who, in response to my appeal, made similar observations in several cases of skin transposition. Their findings confirm mine.

SITE OF TESTICULAR AND OVARIAN PAIN

Observations on Hydrocele

To determine the exact localisation of pain evoked in a healthy organ displaced in the course of normal development an experiment (see below) was carried out in five cases of chronic hydrocele of the tunica-vaginalis testis. Here we have ideal conditions for experimental observation: a single organ, the testis (originally abdominal), enclosed in, and to some extent protected by, a miniature peritoneal cavity (the tunica vaginalis) and covered by the thin skin of the scrotum. Each of these three tissues—viscus, peritoneum, and skin—has its own peculiar and distinctive innervation. I doubt if anyone would claim he knows the exact nerve-supply of the testis (or ovary), but anatomists agree that it comes from the autonomic nervous system, probably through one or more of the three lower thoracic segments of the cord.* The tunica vaginalis and the scrotal skin have a somatic innervation, the former being supplied by the genital branch of the genitofemoral nerve (L 1 and 2), and the latter mainly by the pudendal nerve (S 2–4).

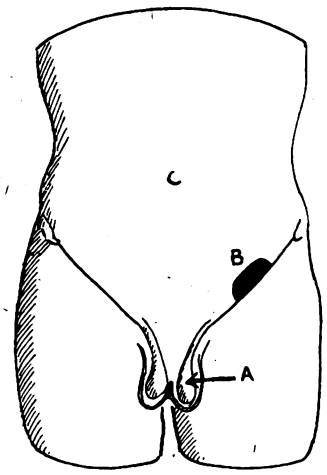

Fig. 3—Localisation of pain in an organ (testis) developmentally displaced: A, site of stimulus; B, site of pain (true testicular pain is *not* located within the scrotum).

After local anæsthetisation of the scrotum the hydrocele was tapped and the fluid evacuated. While this was being done, the serous aspect of the tunica vaginalis was lightly scratched with the needle. Both parietal and visceral layers were sensitive to this stimulus, and local pain was readily evoked. This pain was not particularly severe; several patients likened it to the kind of pain they had at times experienced on compression of the testis. Mackenzie (1920) was one of the first to note that the visceral layer of the tunica vaginalis is sensitive to mechanical stimulation, the reason being that the tunica vaginalis is derived from a process of parietal peritoneum and has, as already mentioned, a somatic innervation. During this stage of the experiment there was no sign of any peritoneocutaneous radiation (Morley 1931) through L 1 and 2.

The fluid evacuated from the hydrocele was replaced by some 30–40 ml. of a 2% procaine solution. In a few minutes the tunica vaginalis—both peritoneal layers—became insensitive to scratching. The needle was then inserted quite painlessly into the body of the testis, and about 3 ml. of 5% saline solution injected. In every case the patient complained of pain which he spontaneously and definitely localised in the lower abdomen at about the level of the internal abdominal ring (fig. 3). One man complained of pain "going through to the back," and indicated its site by placing his hand over the back at about the level of the sacro-iliac joint. Every patient said the pain was deeply situated and not in the skin. The pain was of splanchnic type—i.e., sickening, and much more intense and harder to bear than the pain evoked in the tunica vaginalis. In no case did injection into the testis produce local intrascrotal pain; nor was any pain referred to the skin supplied by T 10–12 and L 1 and 2. In other words, Mackenzie's viscerocutaneous reflex (Mackenzie 1920) was not elicited. Whether the pain-producing stimulus was due to the quality or quantity of the saline solution injected, I am not yet prepared to say.

Observations on Undescended Testicle

On Oct. 11, 1947, a boy, aged 13, with undescended testes, was admitted to hospital. The left testis lay just above the external abdominal ring; the right could not be palpated.

On Oct. 13, 1947, the left side was operated on. The exposed testis was lying between the external oblique muscle and the skin, the most common site in ectopia testis. The coverings of the cord were freely divided and excised, and the testis was placed within the scrotum. A few days later the testis, somewhat turgid, was compressed between fingers and thumb. The boy immediately complained of severe pain, which he located not in the scrotum but slightly above and medial to the middle of the inguinal ligament. On Nov. 27, 1947, the right testis was removed, since the cord was too short to permit the testis to reach the scrotum.

I have examined this boy several times since his operation, the last occasion being in February, 1949. The left testis is well down in the scrotum and has enlarged. Secondary male characters are developing normally. On compression of the left testis pain is felt in the lower abdomen as before, and there is complete absence of local "testicular sensation" within the scrotum.

Why has this boy not acquired normal local "testicular sensation," since he is now aware, by sight and touch, that his left testis is in the normal intrascrotal position? I think the explanation is not that "re-education" has failed but that the genital branch of the genitofemoral nerve was resected along with the coverings of the cord. Resection, or at least division, of the coverings (cremaster muscle and internal spermatic fascia) is a well-recognised procedure to "lengthen" the vas and vessels. The nerve, a minute one, was not identified, but it is highly improbable that it could have escaped resection along with the coverings of the cord. Without a genital nerve it is impossible for this boy to experience "testicular pain" (actually tunica-vaginalis pain) within the scrotum; but, because the testicular nerves are intact, he still can, and does, feel true testicular pain in the normal position—i.e., in the lower abdomen, the embryonic position of the testis. This observation seems to refute the assertion that the testis is supplied by the genitofemoral nerve.

Fig. 4 shows the site of true testicular pain in another case of undescended testis. In this case the testis occupied an unusual position: after coming through the *internal* abdominal ring it had passed *upwards* and was found at operation lying between the internal oblique

Fig. 4—Site of true testicular pain after operation for undescended testis; genital branch of genitofemoral nerve was almost certainly divided, abolishing tunica-vaginalis pain.

* Morley (1931) asserts that the testis "in its descent through the abdominal wall acquired a sensory innervation from the genito-crural nerve (L 1 and 2)." This is on a par with the quaint belief, still held in some quarters, that the gall-bladder is also innervated by a somatic nerve (phrenic, from C 3–5). That the testis and the gall-bladder acquire a somatic innervation while all the other viscera have only an autonomic nerve-supply is (1) highly improbable on embryological grounds; (2) unsupported by reliable anatomical and histological evidence; and (3) easily disproved.

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and external oblique muscles about 2 in. from the abdominal ring. It was anchored in this position by a thin band of connective tissue. I have not seen this type of ectopia testis before.

Those who still suppose that the testis (ovary) is first situated in, and later descends from, a position high in the lumbar region should be disabused and enlightened (as I was) by reading a paper by Wyndham (1947), who examined eleven embryos whose crown-rump lengths ranged from 20 to 56 mm. He writes:

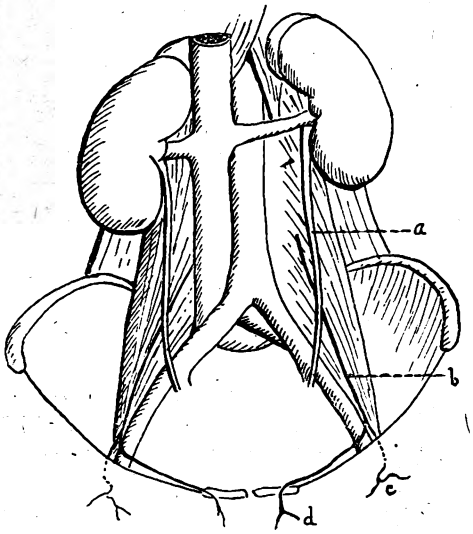

Fig. 5—Ureter crosses and lies in contact with genitofemoral nerve at level of 4th lumbar vertebra: *a*, ureter; *b*, genitofemoral nerve; *c*, femoral branch; *d*, genital branch (to tunica vaginalis). Stimulation of nerve-trunk by ureter causes peripheral pain in tunica vaginalis or labium.

"The statement is often made that the testis begins its descent from the position of the kidney. If this means, as it obviously does, the position of the adult kidney, nothing could be further from the truth. The facts are these. The testis develops as a proliferation of cœlomic epithelium on the anteromedial aspect of the intermediate cell mass, its caudal half in particular. The cephalic limit to this proliferation is vague, but is never extensive. That is, the gonad is from the beginning situated low in the abdomen."

In the same paper Wyndham describes a case of intra-abdominal tumour—"a malignant left testicle attached by a long pedicle to the point where the testicle lies in the embryo, namely, just inside the internal inguinal ring." In this case the symptoms were "attacks of severe left-sided abdominal pain closely resembling Dietl's crises." I had not read Wyndham's paper until after I had operated on the first case of undescended testis and the first two cases of hydrocele mentioned above; and being at that time still under the impression that the testis descends from a much higher level than that described by Wyndham I was somewhat puzzled and disappointed to find that true testicular pain was localised at such a low level. Now one may claim that Wyndham's investigations and my observations confirm each other.

Ovarian pain, like testicular pain, is felt in the lower abdomen. Failure to remember this fact is largely responsible for the removal of many healthy appendices and for the admission of many women with acute gynæcological disorders to general surgical wards.

Reporting a case of twisted ovarian cyst in a girl of 10 years, Crowe (1949) writes:

"She had had a dull pain in the right side of her abdomen and right lumbar region on and off for three weeks, but 48 hours before admission she had had nausea and vomiting with increased pain in the right loin. The pain remained in the back and right side of her abdomen and was at no time central." (A highly significant observation.) "... A diagnosis of acute appendicitis was made and laparotomy was carried out. A Rutherford Morison incision was first employed and a plum-coloured mass was seen in the pelvis. Through this incision it was not possible to observe whether the mass was adherent to gut or not, and so a right subumbilical paramedian incision was carried out, when the mass proved to be a twisted right ovarian cyst."

PAIN "REFERRED" TO THE "TESTIS"

The female of the species may, like the male, have urological diseases and disorders. Both sexes may in the course of some of these conditions complain of pain far distant from the tissue in which it is produced. The male may complain of pain in the "testis," whereas the female complains of pain not in the ovary but in the labium of the vulva. In addition, both sexes generally complain of a concomitant pain in the upper thigh. In the light of these well-authenticated observations it is reasonable to assume that a mechanism common to both sexes is responsible for the production and distribution of these so-called referred pains. It is obvious that the pains mentioned are in both sexes localised in the territory supplied by the genitofemoral nerve.

What is the stimulus that excites the impulse that reaches the brain that projects the pain to the position mentioned? And at what level is the adequate stimulus applied?

Contrary to the general view, I have never been convinced that true renal pain is ever projected (a better term than the ambiguous "referred") to the peripheral endings of the genitofemoral nerve. Over a long period I have noted in particular the distribution of pain due to renal and ureteric calculi, and have come to the conclusion that distant pain occurs only when the ureter is involved, and even then only if the obstructing calculus is impacted at or below a certain level. In only the minority of cases of ureteric calculus is pain projected peripherally. Intermittent attacks of ureteric colic are caused by intermittent obstruction of the muscular tube rather than by the passage of the stone, as is often stated. Many surgeons have had (as I have) under their care patients who, over months or even years, have suffered from repeated attacks of ureteric colic due to calculus obstruction, and have not been operated on. Repeated radiography in these cases generally shows that the position of the calculus remains constant. The stone behaves like a ball-valve.

The genitofemoral nerve (L 1 and 2), after piercing the psoas fascia, extends downwards on the outer side of the common and external iliac vessels; it crosses obliquely behind and *lies in contact with* the ureter at the level of the fourth lumbar vertebra (fig. 5). The genital branch is a minute nerve; it crosses the terminations of the external iliac vessels and, along with the vas deferens and spermatic vessels enters the inguinal canal at the internal abdominal ring. In the male it supplies the tunica vaginalis; in the female it accompanies the round ligament to the labium majus. The femoral (crural) branch supplies an area of skin over Scarpa's triangle.

Another factor merits consideration. When a vital tube—e.g., intestine, ureter, and salivary duct—is suddenly obstructed, certain tissue changes occur. The tube proximal to the obstruction quickly becomes hyperæmic and œdematous; and these reactionary phenomena extend for a variable distance into the surrounding tissues. The threshold for pain is markedly lowered by "inflammatory states," as all who have had a boil, toothache, or a sprained ankle are well aware; but we should not forget that morbid conditions which are visible to our unaided sight are very gross indeed.

If the ureter is obstructed—e.g., by calculus and blood-clot—at or distal to its crossing of the trunk of the genitofemoral nerve, three distinct and separate types of pain may result: (1) true ureteral pain, deep-seated and of splanchnic type (i.e., sickening and hard to bear); (2) residual local pain, not spasmodic but constant, often accompanied by local tenderness and some

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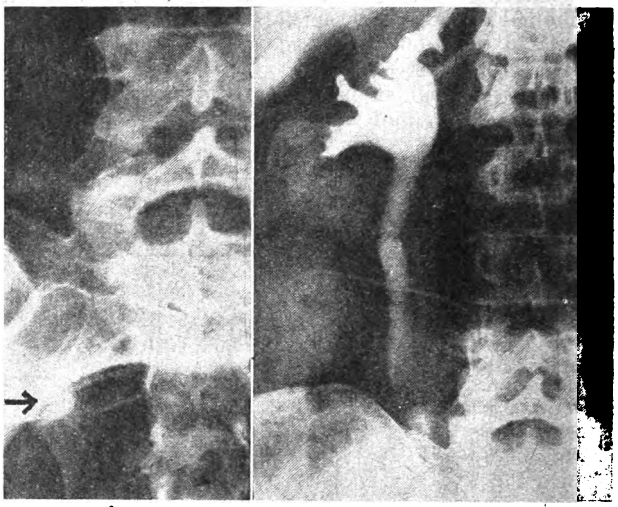
muscular rigidity, and due to stimulation of somatic nerve afferents in the inflamed and congested peri-ureteric tissues; and (3) pain projected to the tunica vaginalis or the labium majus. This third type of pain is, I believe, caused by direct irritation of the genito-femoral nerve by the abnormally strong caterpillar-like contractions of the ureter overlying the nerve. The plain muscle of the ureter (like that of the gut) can quickly hypertrophy. Under normal conditions the peristaltic contractions of the ureter are unperceived; nor do they "irritate" the genitofemoral nerve. But when the ureter is obstructed local conditions are changed; a stronger stimulus is applied to a nerve whose pain threshold is much lowered by hyperæmia, and pain results. Pain is always projected to the peripheral distribution of a pain nerve in which an impulse is excited by an adequate stimulus. This peripheral projection of pain when a nerve-trunk is stimulated is a well-recognised phenomenon; it occurs in cases of cervical rib, prolapsed disc, &c., and is, I suggest, the mechanism that produces knee pain in arthritis of the hip.

Some years ago, after removing a stone from the lower third of a ureter, I drained the wound with a soft rubber catheter, which I deliberately placed across and in contact with the genitofemoral nerve and anchored with a catgut stitch to the psoas muscle. A few days later, gentle tugging on the catheter caused acute pain which "radiated to" the tunica vaginalis (the patient said *testis*). The patient said the pain so produced was exactly like the pain "in the testis" he had several times experienced during attacks of ureteric colic. I suggest that the friction of the catheter on the genitofemoral nerve produced the same effect—i.e., pain in the tunica vaginalis (not in the testis)—as does the caterpillar-like movement of the hypertrophied ureter.

Figs. 6 and 7 show the level of a calculus in a woman who, in several attacks of ureteric colic, complained of pain in the right labium. The ureter in this case was dilated, and probably hypertrophied, above the obstruction. The stone, revealed by radiography, was later passed per vias naturales.



6 7

Fig. 6—Arrow shows site of calculus in right ureter; in several attacks of ureteric colic pain was projected to right labium majus; stone was passed later.

Fig. 7—Dilatation and hypertrophy of ureter above impacted calculus (same case as in fig. 6).

DISCUSSION AND CONCLUSIONS

Pain is distributed segmentally. This is an obvious truth—pain could not be distributed otherwise—but it is not the whole truth. The site of pain may coincide with the position of the tissue in which it is produced. On the other hand, pain may be felt at a distance from the tissue in which it is produced. I believe that coincidence of tissue and the position of pain evoked in it is "largely fortuitous" (Lewis 1942) and immaterial. We know that pain can be projected to a precise position where no tissue exists—phantom-limb pain. Cyriax (1942) writes of "referred pain": "When the strength of the stimulus is great enough, the patient feels a pain somewhere within, or diffused all over, the segment in which it arises." I disagree with this generalisation and am convinced that "referred" pain is, like local pain, projected to a specific and constant site within, and not just "somewhere within, or diffused all over," the segment. For instance, stimulation of the *anterior* part of the central diaphragm evokes pain which is felt in the *front* of the shoulder—not just "somewhere within" the segment innervated by C 3–5. The same exact and constant localisation occurs when pain is produced in the testis (ovary), appendix, &c.

Degree of sensitivity and accuracy of localisation depend on (1) the richness or paucity of the afferent nerves in the tissue concerned; (2) the cross-section of these nerve-fibres (fibres with the largest cross-section have the greatest excitability, the greatest velocity of nerve impulse, and the lowest threshold to stimulation); and (3) the threshold level under the conditions of the moment.

The peripheral endings of pain nerves are "free"—i.e., not encapsulated like the nerve-endings of other nerves. Only in the case of pain nerves carried in somatic nerve pathways have these free nerve-endings been convincingly demonstrated by histological methods. Pain nerve-endings have not been demonstrated in the gut or other viscera supplied only through the autonomic nervous system. The inference is that the autonomic pain nerves are of small calibre, and that their threshold level for pain is high; but we know that visceral (splanchnic) pain can be evoked, provided the pain threshold is lowered—e.g., by hyperæmia, by emotional states, and by drugs—and the stimulus is adequate. The reference map for tissues supplied by the autonomic nervous system may well be in the thalamus rather than in the cortex of the brain. There is evidence supporting this view.

On these grounds it seems reasonable to assume that light trauma applied to the testis causes local intra-scrotal (tunica vaginalis) pain and that more severe trauma causes true testicular pain, because in the former case a somatic nerve (genitofemoral) of relatively large cross-section and with a low pain threshold is stimulated, whereas in the latter case a stronger stimulus is required to evoke pain in a tissue (the testis) innervated by autonomic nerves of small calibre and with a high threshold.

Cohen (1944), referring to my suggestion (Brown 1942) that pain produced in displaced organs is projected to "primitive and primary sites," writes: "But no such hypothesis is necessary if the segmental radiation of pain be accepted." (I also accept that.) "Nor does it explain why most frequently the pain is felt in the mid-line." That is easily answered: unpaired organs have a bilateral innervation, and therefore pain produced in such an organ—e.g., the appendix (originally mid-line)—is always bilateral (midline, central, or mesial), whereas pain produced in paired organs—e.g., testes—which have a unilateral innervation is always unilateral.

The peripheral nerve-endings detect and accept the specific sensations for which they were specially modified, but the corresponding cerebral centres possess no such fastidious discrimination. They are mere responders rather than "central analysers" (Pavlov) and always

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make the normal response, whether the stimulus is normal (at the periphery) or abnormal (at the nerve-trunk). The cerebral centre recognises the unit of tissue "as the source of the message" (Lewis 1942) and projects the particular sensation (pain, sound, smell, &c.) to the site it *believes* the unit to occupy. If the unit has been displaced, artificially or developmentally, after acquiring its innervation, the sensation evoked must naturally and inevitably be projected to the position of the unit "registered" in the sensorium. It can make no difference whether the displacement has been accomplished in an instant, an hour, a few weeks, or several months, or whether the displacement (migration) is temporary or permanent. It is rather like registering an address with the Post Office. Unless notified of a change of address, the forwarding department will continue to send all communications to the original registered address. It matters not whether the addressee is in residence or has migrated to distant parts. Indeed, the residence may have been destroyed and the addressee may be dead—e.g., a patient may complain of pain in a finger or toe of a phantom limb.

It is possible that the "local sign" may be changed by training—trial and error—and aided by sight and touch, in the case of superficial displacements, so that in time the displaced tissue will be perceived in its true position and not in its original one; but in the case of the deep-seated displacements "re-education" (reconditioning) of the corresponding cerebral centres seems to be impossible, since we are unaware of the presence and position of the tissues concerned.

Pain can be evoked only when a sufficient number of afferent nerve-fibres are stimulated; the degree of sensitivity depends on (1) the density and size of cross-section of these nerves, and (2) the threshold level under the conditions of the moment.

The so-called paradoxes of visceral pain—i.e., (1) that the viscera are (relatively) insensitive to physical, thermal, and chemical stimulation, and (2) that pain may be located at a distance from the viscus in which it is produced—are, in my opinion, more apparent than real. To my mind it is just as natural and inevitable that testicular (ovarian) pain should be projected to the lower abdomen as that, say, elbow pain should be projected to the elbow.

It is generally agreed that anatomical structure is completed in anticipation of function. Localisation of pain is also predetermined by anatomical structure.

Is there any need for theories which postulate a reference or radiation, through an "irritable focus" in the spinal cord, of deep-seated pains to the skin? In my opinion all such theories are fallacious and superfluous. They might well be allowed to die an honourable death.

With more perfect histological methods the exact innervation of the viscera may possibly be demonstrated; then speculation will become unnecessary.

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THE EFFECT OF TETRAETHYLAMMONIUM BROMIDE ON THE KIDNEYS

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THE use of tetraethylammonium bromide (T.E.A.B.) in conditions accompanied by oliguria due to renal cortical ischæmia (Stock 1948) is based on experiments on rabbits in which Stock shows that T.E.A.B. can prevent renal cortical ischæmia.

However, before one goes ahead with administering T.E.A.B. to patients with depressed renal function where renal ischæmia is suspected, it would be well to consider what we know about the effect of T.E.A.B. on normal human kidneys. Very little of real value has been published on this subject. Lyons et al. (1947, 1948) reported a moderate reduction of urinary volume, glomerular filtration-rate (sodium thiosulphate), and renal plasma-flow (sodium hippurate) only when there was a significant fall in blood-pressure. Such a fall was usually found only in severe hypertension. According to these workers changes in renal function after T.E.A.B. thus seem to be correlated with, and dependent on, changes in blood-pressure. They do not give figures that can be subjected to criticism or discussion.

We examined the renal response to intravenous T.E.A.B. in eight normal persons, four men and four women, aged from 23 to 47. We tried to give intravenous T.E.A.B. in such a way as to prevent a fall in blood-pressure, so that we could exclude the effects due to such a fall.

METHODS

The urinary volume was measured with an indwelling catheter. Residual urine was washed out of the bladder with measured amounts of water, and the last drops were expelled by injecting air and applying pressure over the symphysis. The glomerular filtration-rate was determined with the help of inulin-clearance, endogenous creatinine-clearance, and urea-clearance tests. Renal plasma-flow was determined with sodium *p*-amino-hippurate (P.A.H.). For the sake of accuracy a sufficiently large diuresis was produced by drinking water.

Inulin and P.A.H. were administered in physiological saline solution by continuous intravenous drip. The whole procedure was almost exactly as described by Smith et al. (1945); it has also been described by Brod and Sirota (1948), Chasis et al. (1938, 1945), and Goldring and Chasis (1944). T.E.A.B. was injected at the rate of 100 mg. per min. into the rubber tube for the intravenous drip, 20 cm. from the cannula. It was therefore well diluted in the saline solution before it entered the blood-stream.

RESULTS

In the following experiments, before the injection of T.E.A.B., resting values were determined during two periods of about 10 minutes each. Blood-pressure was measured each minute, but only the lowest value in each period is recorded in the tables.

Details of four of the experiments are given below.

EXPERIMENT I (table I).—After two normal periods T.E.A.B. 400 mg. was given at the rate of 100 mg. per min. into the rubber tube. A drop in diastolic blood-pressure of 5 mm. Hg was observed. (A drop not larger than 5 mm. is in this study considered insignificant.) The drop lasted only a short time. The urinary volume diminished considerably for 40 min. despite the fact that the blood-pressure had returned to normal much earlier. After 40 min. diuresis increased until it exceeded its resting value. (None of the subjects of these experiments drank any water during the experiments.) In the third period, in which T.E.A.B. was given, there was a significant decrease in renal plasma-flow, which returned to normal in the fifth period. The glomerular filtration-rate

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fell in the third and fourth periods. The decrease in diuresis, renal plasma-flow, and glomerular filtration-rate was not related to fluctuations in the blood-pressure. Nor was there any relation between fluctuations in diuresis and plasma-flow or glomerular filtration-rate. The filtration fraction was practically unchanged.

EXPERIMENT II (table II).—The blood-pressure did not fall after the injection of T.E.A.B. 500 mg. Nevertheless there was a severe and abrupt decrease in diuresis, and a severe fall in renal plasma-flow and glomerular filtration-rate. This fall was most pronounced in the third period, but was observed also in subsequent periods. The filtration fraction was practically unchanged.

EXPERIMENT III (table III).—The blood-pressure did not fall after injection of T.E.A.B., but diuresis decreased slightly. A moderate fall took place in renal plasma-flow and glomerular filtration-rate. The filtration fraction remained unchanged.

EXPERIMENT IV (table IV)—The diastolic blood-pressure fell by 10 mm. Hg. There was a sharp decrease in diuresis in the fourth period, when the blood-pressure had returned to resting values. The renal plasma-flow was reduced in the third period and still more in the fourth. The glomerular filtration-rate was also much reduced. The filtration fraction was slightly increased in the fourth period, and more so in the fifth (an error in the inulin-clearance figures is probable).

The eight experiments are summarised in table V, which shows that diuresis decreased in six of them —moderately in two and much in four. In a seventh case there was only a very slight decrease in diuresis, and in the eighth no certain conclusions could be drawn, because diuresis decreased before the T.E.A.B. was injected.

TABLE I—EFFECT OF T.E.A.B. ON CASE 4, A WOMAN AGED 39 (EXPERIMENT I)

Period	Blood-pressure (mm. Hg)	Urine (ml./min.)	P.A.H. clearance (ml./min.)	Inulin clearance (ml./min.)	Endogenous creatinine clearance (ml./min.)	Urea clearance (ml./min.)	Renal blood-flow	Filtration fraction (%)
I } At	..	9·8	604	131	91	78	928	21·7
II } rest	120/75	7·6	590	123	90	..	908	20·8
III T.E.A.B. 400 m.g.	115/70	5·6	488	111	71	..	750	22·7
IV ..	115/75	1·0	535	110	70	50	823	20·5
V ..	130/80	0·8	650	131	79	..	1000	20·1
VI ..	130/75	0·5	..	..	..	..	..	..
VII ..	..	2·4	..	..	..	..	..	..
VIII ..	..	2·5	..	..	..	..	..	..
IX ..	..	5·4	..	..	..	..	..	..
X ..	..	9·8	..	..	..	..	..	..
XI ..	..	13·3	..	..	..	..	..	..

TABLE II—EFFECT OF T.E.A.B. ON CASE 6, A MAN AGED 42 (EXPERIMENT II)

I } At	110/60	9·7	726	114	109	77	1210	15·7
II } rest	110/60	10·4	749	131	115	..	1248	17·5
III T.E.A.B. 500 mg.	110/65	1·9	259	47	42	..	430	18·0
IV ..	100/65	4·2	569	103	87	56	947	18·1
V ..	110/70	3·4	479	83	61	..	798	17·3
VI ..	..	3·1	408	79	68	..	679	19·4
VII ..	..	2·4	..	..	..	..	..	..

TABLE III—EFFECT OF T.E.A.B. ON CASE 5, A MAN AGED 37 (EXPERIMENT III)

I } At	..	15·1	888	122	112	..	1645	13·8
II } rest	125/80	16·0	898	117	121	73	1663	13·5
III T.E.A.B. 400 mg.	110/85	14·2	776	98	106	73	1431	13·7
IV ..	120/85	14·5	810	102	108	..	1500	13·4
V ..	125/85	15·6	874	116	111	..	1620	12·7

TABLE IV—EFFECT OF T.E.A.B. ON CASE 2, A WOMAN AGED 46 (EXPERIMENT IV)

I } At	..	11·2	768	120	96	..	1280	15·0
II } rest)	105/65	12·3	628	114	90	64	1045	18·0
III T.E.A.B. 250 mg.	80/55	8·1	428	82	67	..	713	19·0
IV ..	100·65	0·4	382	83	58	..	637	22·0
V ..	105/65	1·5	644	164	104	44	1072	26·0

TABLE V—SUMMARY OF EFFECTS OF T.E.A.B. IN CASES 1–8

Case no.	Sex	Decrease in diuresis	Greatest fall (% of resting values)			
			Diastolic blood-pressure	P.A.H. clearance	Inulin clearance	Endogenous creatinine clearance
1	F	Moderate	0	16	4	23
2	F	Severe	15	45	30	38
3	F	None	0	11	8	20
4	F	Severe	0	18	13	22
5	M	Slight	0	13	18	9
6	M	Severe	0	65	62	62
7	M	Severe	12	34	25	31
8	M	Moderate	0	29	53	51
Women (average)	..	..	4	25·0	13·8	25·8
Men (average)	..	..	3	35·3	39·5	38·3

Each period usually represents 10 min. Renal blood-flow is calculated from P.A.H. and hæmatocrit value. Filtration fraction is inulin clearance as percentage of P.A.H. clearance. All clearances have been corrected to a common standard surface of 1·73 sq. metres. The figures are the means of two determinations.

The blood-pressure fell to a significant extent in two of the eight experiments. The renal plasma-flow decreased in all of them, and so did the glomerular filtration-rate.

On the average all clearances fell about 30% of the resting values. Whether the difference found between the men and the women in this respect is significant cannot be said.

Urine.—In three women a positive Heller test for albumin was found in the periods with the lowest diuresis. In one of these instances blood appeared in the subsequent periods. In the fourth woman blood appeared simultaneously with protein. The hæmorrhage may possibly have been caused by the catheter. The finding of protein without hæmorrhage cannot be explained by the catheterisation, and it must be assumed to be of renal origin. A positive Benedict test was observed in the third and fourth periods after the injection of T.E.A.B. in one woman, but not in the following four periods.

Other Symptoms and Signs.—For a few minutes after the injection of T.E.A.B. a headache was usually present. It was felt as pressure behind the eyes. Visual disturbances, and on two occasions a sensation like fainting, were experienced. Slight sensations of paræsthesia were noticed. All these sensations usually disappeared within 5–10 min. There were hardly any objective signs. The skin appeared more pale than flushed. The pulse-rate was always increased. The slight effect on the peripheral vessels and the blood-pressure may be explained by the slow injection of rather moderate amounts of T.E.A.B. through the rubber tube with resulting dilution.

DISCUSSION

We used exactly the same experimental procedure, except the injection of T.E.A.B., in about 65 experiments, each with serial determinations of all the clearances mentioned here, on normal people and in different clinical conditions. In none of them did we see a decrease in diuresis or the appearance of protein in the urine as in the present experiments with T.E.A.B.

We do not stress the importance to the positive blood test, and the appearance of red cells, white cells, and epithelial cells in the urine. These findings might be explained as traumatic, produced perhaps by catheterisation. But it seems significant that protein did not appear in the urine except where T.E.A.B. was used. We can only suppose that T.E.A.B. caused the proteinuria.

Similarly we can ascribe the considerable decrease in diuresis to T.E.A.B. (Two different preparations of T.E.A.B. were used, and they gave similar results.) As mentioned above, a copious diuresis was always secured in the clearance periods for the sake of accuracy. The

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fact that a similar decrease in diuresis after T.E.A.B. has not been published before now may be due to the assumption that nothing like this will happen with a smaller or "normal" diuresis.

In some simple experiments we measured the fasting diuresis before and after the intravenous injection of T.E.A.B. 400–500 mg. In three of four experiments a slight but definite decrease in diuresis was noted; but, since accurate measurement of small volumes of urine makes longer periods necessary (30 min.), this tends to obscure variations of shorter duration. Thus there is reason for the assumption that the inhibitory action of T.E.A.B. on diuresis is more easily observed when diuresis is high than when it is low. At present one can only speculate about the mechanism responsible for the diminished diuresis and the proteinuria. The effect is clearly not one of peripheral shock. Seven out of the eight people were quite undisturbed. One person was slightly upset through nervousness; this was the woman whose diuresis decreased before T.E.A.B. was injected.

The changes in diuresis were in none of these cases related to changes in blood-pressure. Nor were they related to changes in renal blood-flow or glomerular filtration-rate. We admit that diuresis in our experiments usually decreases with the decrease of renal blood-flow and glomerular filtration-rate, but we have several times noted that the decrease of diuresis far outlasts the fall in the clearances, and that the diuresis may decrease still further as the renal blood-flow or glomerular filtration-rate rises again. The decrease of diuresis must therefore be explained by increased reabsorption of water in the tubules. This again must be due either to a direct action of T.E.A.B. on the renal tubules or an action on the posterior lobe of the pituitary gland. Though the latter explanation is more consistent with the usual trends of thought, a few facts are more compatible with the former. Proteinuria does not appear after injections of posterior-pituitary extracts. The pituitary response usually appears after an interval which seems to be longer than the time between the injection of T.E.A.B. and the decrease in diuresis. This decrease can be shown to have started before the injection of T.E.A.B. was completed.

As regards the renal plasma-flow and blood-flow, it is necessary to emphasise a couple of points.

What one measures with clearance methods (P.A.H. or 'Diodrast') is the amount of blood (plasma) flowing past functioning renal parenchyma. If a shunt should take effect, with blood going more directly from artery to vein, this blood would escape determination. With plasma-flow or blood-flow in experiments like these one thinks only of blood passing functional renal tissue.

When diuresis rapidly diminishes, as often happens after T.E.A.B., the change in composition of the urine will appear in the bladder urine after some delay. As a result, the concentration of inulin and hippurate in the urine will show a lower value than it really should. The clearance values will consequently be more or less artificially depressed. When diuresis increases, the reverse effect comes into play.

We calculated the greatest error this delay could produce, and found that the delay was responsible only for a small fraction of the fall in the clearance values. The main part of the fall was real.

The decrease in renal plasma-flow and filtration-rate is not related to changes in blood-pressure. It is always a direct sequel to injection of T.E.A.B. and is usually followed by a return to normal values. It must therefore be assumed to have been caused by T.E.A.B. When blood-pressure is unchanged and renal blood-flow reduced, this must be explained by renal vasoconstriction. The reduced filtration-rate and the unchanged filtration fraction show that the afferent vessels are constricted equally with the efferent vessels.

CONCLUSIONS

The administration of intravenous T.E.A.B. to normal adults in doses of 4–6 mg. per kg. of body-weight significantly reduces the renal blood-flow and glomerular filtration-rate. This effect is caused by renal vasoconstriction. T.E.A.B. also produces an acute and significant decrease of water diuresis, often with proteinuria. It may also be responsible for other changes in the urine. These effects must be due, partly or wholly, to an action on the kidneys, presumably on the nephrons, causing proteinuria and decreased diuresis, and on the renal vessels, causing constriction.

These results suggest restraint in using T.E.A.B. in conditions where there is reason to believe that renal vascular spasm plays a part.

SUMMARY

The effect of T.E.A.B. on the kidneys was examined in eight normal adults as regards changes in water diuresis, urine, glomerular filtration-rate, and renal plasma-flow.

Intravenous infusion of T.E.A.B. usually caused a considerable decrease in diuresis almost immediately, sometimes accompanied by proteinuria. The renal plasma-flow and filtration-rate were also reduced significantly. Blood-pressure was only slightly affected, and the changes in urine and in renal function could not be attributed to its reduction. These changes must therefore be assumed to be caused by the action of T.E.A.B. on the renal parenchyma and renal vessels.

T.E.A.B. may act partly through an effect on the posterior lobe of the pituitary gland.

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SUDDEN DEATH FROM TETRAETHYLAMMONIUM BROMIDE

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THE introduction of the tetraethylammonium ion for temporarily blocking autonomic ganglia (Acheson and Moe 1946) has encouraged many workers to experiment in its diagnostic and therapeutic application. Interest has been focused especially on peripheral vascular disease, causalgia, and hypertension (Berry et al. 1946, Boyd et al. 1948, Hayward 1948, Levinson et al. 1948, Lyons et al. 1947, 1948, Werkö 1948), particularly in relation to the effect of sympathectomy (Birchall et al. 1947, Lyons et al. 1947). Further, tetraethylammonium bromide (T.E.A.B.) has been used as a means of diagnosis in examination of the motility of the intestinal tract (Chapman et al. 1948, Holt et al. 1947) as well as in the treatment of eclampsia (Werkö 1948). It is to be expected that its range of application may be further extended.

T.E.A.B. or the chloride (T.E.A.C.) has been used on several thousand patients, and is generally held to be quite harmless; but a few serious reactions have been observed.

Lyons et al. (1947), who treated more than 400 patients with T.E.A.B., found a great fall in blood-pressure, with peripheral circulatory collapse in a few hypertensive patients,

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and a sudden brief hyperventilation in 4 patients treated with large doses.

Birchall et al. (1947), using excessively large doses, observed curariform effects necessitating artificial respiration and the use of neostigmine. One of Birchall's patients, who had not previously had asthma, developed a serious attack of asthma.

Friedlich et al. (1948) have reported a severe reaction following the administration of only 230 mg. of T.E.A.C. to a woman with low-normal blood-pressure. There was "ineffectual gasping respiration of an alarming nature" followed by hyperventilation; the blood-pressure fell to extremely low values for several hours, and the patient improved only slowly after intravenous adrenaline had been given. Paroxysmal auricular tachycardia set in, persisted for eighteen hours, and only subsided after quinidine had been given.

Finally, Lindgren and Frisk (1948) have observed myocardial infarction immediately following treatment of arteriosclerotic cardiac disease with T.E.A.B.

In 1947 I treated 7 cases of bronchial asthma with T.E.A.B. In the first 6 cases the effect on the asthma was but slight; in 2 cases T.E.A.B. checked the attacks, and in the remaining 4 the asthma was slightly aggravated. The dosage was 300–400 mg. injected intravenously. In none of these 6 cases were any alarming side-effects observed; but the seventh patient died immediately after the injection of T.E.A.B.

CASE-RECORD

An architect, aged 63, was admitted with bronchial asthma. There was no familial predisposition to allergy. Except for the present illness, which began when he was 61 years old, the patient had been well. The bronchial asthma had gradually become worse during two years, and, apart from symptomatic relief provided by ephedrine tablets and nebulised adrenaline, all treatment had been ineffectual. Shortly before admission the patient had been in the mountains in Norway for two months without benefit.

On examination the respiratory system showed nothing more than pronounced pulmonary emphysema and intermittent sibilant rhonchi over both lungs, a mucous polyp as big as a pea in the left side of the nose, and slightly reduced vital capacity. There was a slight eosinophilia. Electrocardiography showed only a moderate left-sided axis-deviation. Radiography of heart and lungs showed nothing abnormal apart from the emphysema. The blood-pressure was 150/90. Intracutaneous tests, including dust from the patient's home, were negative.

Treatment.—During the fifteen days the patient stayed in the hospital he had several attacks, especially at night, and he often had to have adrenaline, given with a nebuliser and subcutaneously, as well as theophylline intravenously and as suppositories. These agents generally checked the attacks. Since the patient's condition did not improve, it was decided to try T.E.A.B. He at this time had an asthma attack of medium strength but was not particularly ill. Four and two min. before injection the blood-pressure was 140/90 and 138/90 and the pulse-rate 88 and 90. A 10% solution of T.E.A.B. was injected intravenously. After forty seconds, during which time the pulse-rate had accelerated to about 100, 230 mg. (2·3 ml.) had been injected, when suddenly the patient became pulseless, gasped for breath a few times, stopped breathing, and became unconscious. 1 ml. of adrenaline 1 in 1000 was at once given intravenously, and artificial respiration was begun with oxygen. As the patient did not respond to this treatment, adrenaline was given intracardially, and large doses of intramuscular nikethamide were given later; but death seemed to have been instantaneous.

Necropsy twenty-two hours later showed pronounced pulmonary emphysema, slight atheromatosis of the lumbar aorta, and a right-sided renal cyst about 1 cm. long. The heart was normal, without arteriosclerosis of the coronary arteries. Microscopy of the lungs showed pronounced emphysema, bronchitis, and accumulation of mucus in the smaller bronchi. Nothing abnormal was found on microscopy of myocardium, kidneys, suprarenal glands, brain, prostate gland, or intestines. The examination thus revealed no organic changes to explain the sudden death.

DISCUSSION

The immediate cause of death in this patient cannot be definitely established, but there is no reason to suppose that anything but the T.E.A.B. was responsible.

The most likely explanation is a sudden excessive hypotension, due either to lowering of the blood-pressure or to ventricular fibrillation, analogous to the paroxysmal tachycardia observed by Friedlich et al. (1948). The blood-pressure was not measurable after the reaction set in, but the rising pulse-rate suggests a fall in blood-pressure.

The clinical picture of the sudden collapse did not at all resemble an acute aggravation of the asthma attack with suffocation. The possible connexion between the asthma and the death deserves closer examination. Birchall et al. (1947) observed an attack of asthma in a patient after the administration of T.E.A.B., and respiratory disturbances following T.E.A.B. were observed in Friedlich's case and have been seen by others.

Blomberg and Lindqvist (1948) treated 5 bronchial-asthma patients with doses similar to those used by us; 2 of these patients developed violent reactions, 1 of them becoming unconscious, with an unmeasurable blood-pressure, but recovering after administration of adrenaline. These workers later treated a further 5 cases of bronchial asthma with T.E.A.B. and here also several severe reactions were observed despite great caution (personal communication).

Probably the rate at which the injection was given was of decisive significance in our case. We complied with the directions given by Berry et al. (1946), according to whom 100–500 mg. can be injected in 15–60 sec. Judging by the later experiences of Blomberg and Lindqvist even 50 mg. per minute seems to be too fast.

It is hardly possible at present to give any entirely satisfactory explanation why asthma patients are especially sensitive to the action of T.E.A.B. We used T.E.A.B. in the treatment of asthma in the hope of reducing the vagal tone, which is generally assumed to be one of the pathogenic factors in asthma. It is quite definite that the vagus is blocked (intestinal paralysis, &c.), but in some asthma patients blocking of the autonomic nervous system means a profounder interference with nervous regulation than in other people.

Effective treatment was hardly possible in our case. In less violent reactions after T.E.A.B. the patients have responded well to adrenaline, which has a direct effect independent of the blocked ganglia. Page and Taylor (1947), however, advise against the use of adrenaline as an antidote to T.E.A.C., which is claimed to be able to increase the sensitivity to the pressor effect of the adrenaline, producing a sharp rise in blood-pressure, with the risk of cerebral or cardiac lesions. Against the curariform effects of very large doses observed by Birchall et al. (1947) neostigmine is recommended.

Since the use of T.E.A.B. in asthma does not seem to be particularly effective, and since it is attended by risk, it appears to be inadvisable.

SUMMARY

The sudden death of an asthma patient after the injection of 230 mg. of T.E.A.B. is reported. At necropsy no other cause of death was found.

It seems that the response to T.E.A.B. may be greater in asthma patients than in normal people.

Owing to this risk, and to the fact that T.E.A.B. does not seem to be particularly effective against asthma, its use for this purpose is advised against.

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FACTORS AFFECTING THE RESPONSE OF IMMUNISED GUINEAPIGS TO ANTIGENIC STIMULUS

FURTHER OBSERVATIONS

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IN a previous communication [1] it was shown that the customary response of immunised guineapigs to the stimulus of a specific antigen was but little affected by exposure to cold, restriction of diet, or intercurrent infection with *Cl. welchii*. The experiments had a practical application to the protection of war casualties against tetanus. In the United States armed forces active immunisation against tetanus was compulsory, and it was argued that, since the immunised casualty would have either an adequate concentration of circulating antitoxin or an established immunising mechanism which could be stimulated into activity by exposure to natural infection or the injection of specific antigen, the administration of tetanus antitoxin was unnecessary and the injection of tetanus toxoid was a more logical procedure. The results of our experiments supported this contention and indicated that, despite the adverse conditions of the battle-field and the lowering effect of infected wounds, injured persons who had previously been immunised against tetanus might be expected to develop tetanus antitoxin in response to an injection of tetanus toxoid. The experiments also showed that, though the increase in antitoxin was large on the tenth day, in two-thirds of the guineapigs the rise was delayed until the fifth day after injection. This delay is customary and did not seem to be affected by the adverse conditions imposed in the experiment.

In discussing these observations it was suggested that, if the restriction of diet had been more severe or prolonged or continued until the physical condition of the guineapigs had deteriorated further, the response of emaciated or debilitated animals to antigenic stimulus might have been less pronounced or absent. Regarded in this way the question assumed a new importance because of its application to conditions in Europe and Asia when the war ended and large populations were living in conditions approaching starvation. Among the public-health measures to be taken in the interests of such populations the question of their active immunisation against infectious diseases arose, and it seemed that any information which could be gained from the behaviour of other animal species under similar adverse conditions of inadequate nutrition might be of interest and value.

Still earlier experiments [2] had shown that in normal non-immunised guineapigs the response to the injection of diphtheria toxoid was very much affected by the diet. All other conditions being the same, guineapigs given mangolds did not thrive, all of them did not survive, and the antibody response of the survivors was trifling; whereas guineapigs given cabbage instead of mangolds all survived, remained well, gained weight, and could be immunised very easily. In another series of experiments it was shown that there was a correlation between the amount of cabbage eaten and the antitoxin produced in response to injection of toxoid. The present paper is an account of the extension of these observations, especially as regards immunised guineapigs.

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EXPERIMENTS

While the main object was to study the effect of a more protracted restriction of the diet, the opportunity was taken to investigate the effects of two other factors on the response of immunised animals to antigenic stimulus: (1) a moderate degree of tetanus induced by the injection of a sublethal dose of tetanus toxin, the ensuing tetanus persisting during the whole period of the secondary response; and (2) the intravenous injection of indian ink.

As on a previous occasion, nearly 100 guineapigs were available for the tests. Several months before the experiments were begun these animals had been immunised against diphtheria by the injection of two spaced doses of alum-precipitated toxoid (A.P.T.). The antitoxin content of the serum of each animal had been separately determined ten days after the second injection and again on several subsequent occasions, the last being about eight months after the first injection of antigen. We selected 60 guineapigs, in 55 of which the circulating antitoxin ranged from 2 to 0·25 units per ml. These were divided into four groups of 13, 13, 12, and 12, while 10 were reserved as controls to special parts of the investigation.

Past experience of guineapigs at this stage of immunisation suggested that the antitoxin concentration would either have reached a steady level or would still be declining slowly. Since the point might be important in the interpretation of the results of the experiments, the antitoxin content of the serum of 54 of these guineapigs had been determined fifty-eight days before the last bleeding referred to above. It was found that, in this interval, in 27 animals the value had remained unchanged, in 24 it had declined to one half, and in only 3 had it increased—in 2 from 1 to 1·5 units per ml. and in the third from 0·5 to 1 unit per ml.

The four groups of guineapigs were housed in the same room and maintained under the conditions described elsewhere.[1] For the purpose of the experiment the four groups were treated as follows:

(1) *Normal Controls.*—The 13 animals in this group were given a daily ration of bran 15 g. and sugar-beet-pulp residue 15 g. made into a mash with water in the morning, and cabbage 50 g. and hay in the evening.

(2) *Restricted Diet.*—The diet was restricted for twenty-one days before the injection of specific antigen. For twenty-four hours the 13 animals of this group were given water but no food; for the next nine days each animal was given a daily ration of bran 15 g. and sugar-beet-pulp residue 15 g. made into a mash with water; on the next eleven days hay was added to the diet. No cabbage or fresh green food was given to this group. During this period the guineapigs lost weight, the average decline being 20% by the twenty-first day.

(3) *Sublethal Tetanus.*—Four days before the injection of specific antigen each of the 12 animals in this group was injected with a quantity of tetanus toxin adjusted to the animal's weight and known to produce moderate symptoms of tetanus from which the animals invariably recovered. On the morning of the third day after the injection of tetanus toxin each animal showed signs of tetanus, which were more pronounced next day. The symptoms—rigidity of the body and a slight curvature of the spine were the most prominent—did not increase in severity, but the condition persisted for about fourteen days; and the symptoms became less pronounced and disappeared from seven to fourteen days later. Though the tetany was pronounced and long-lasting,

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INCREASE IN ANTITOXIN FOLLOWING INJECTION OF SPECIFIC ANTIGEN INTO IMMUNISED GUINEAPIGS

Normal controls			Restricted diet			Non-fatal tetanus			Indian-ink injection		
A.T. units/ml.		Increase in A.T.	A.T. units/ml.		Increase in A.T.	A.T. units/ml.		Increase in A.T.	A.T. units/ml.		Increase in A.T.
Before antigen	10 days after		Before antigen	10 days after		Before antigen	10 days after		Before antigen	10 days after	
2	4	2 ×	2	4	2 ×	1·5	16	10 ×	2	4	2 ×
2	8	4 ×	1·5	4	3 ×	1	6	6 ×	2	6	3 ×
2	8	4 ×	0·5	2	4 ×	1	6	6 ×	2	8	4 ×
1	8	8 ×	0·5	2	4 ×	1	6	6 ×	2	12	6 ×
0·5	6	12 ×	0·5	2	4 ×	1	8	8 ×	1·5	16	10 ×
0·5	16	32 ×	0·5	2	4 ×	1	8	8 ×	1·5	24	16 ×
0·25	4	16 ×	0·25	8	32 ×	1	12	12 ×	1	6	6 ×
0.25	6	24 ×	0·05	2	40 ×	1	12	12 ×	0·5	4	8 ×
0·25	8	32 ×				0·5	4	8 ×	0·5	4	8 ×
0·25	8	32 ×	(5 died four or five days after injection of antigen)			0·5	8	16 ×	0·5	6	12 ×
0·25	8	32 ×				0·1	8	80 ×	0·5	8	16 ×
0·05	3	60 ×				0·1	12	120 ×	0·25	6	24 ×
0·05	3	60 ×									
Geom.mean: 0·39	6·24		0·47	2·83		0·63	8·20		0·96	7·34	

A.T. = antitoxin.

the animals could feed and lost only a trifling amount of weight; all completely recovered. These animals received the same diet as the control group.

(4) *Indian Ink.*—On the morning of the day on which the specific antigen was given, each of the 12 animals in this group was given an intravenous injection of indian ink. The volume, adjusted to the guineapig's weight, varied from 0·4 to 0·5 ml. These animals received the same diet as the control group.

On the same day, and at a time when group 2 had been on a restricted diet for twenty-one days, group 3 had developed moderate tetanus, and group 4 had survived an intravenous injection of indian ink, each guineapig was injected subcutaneously with the equivalent of 1 flocculation unit of A.P.T. contained in 1 ml. of physiological saline solution. Two days before, and again ten days after, this injection the serum-antitoxin level of each guineapig was determined; the results are collected in the accompanying table, which also shows the extent of the increase in the antitoxin content of each animal in each group.

DISCUSSION

All the surviving guineapigs in all the groups showed an increase in serum-antitoxin level, and, with the possible exception of 3 in which the level was only doubled, the increases are significant and due to the injection of A.P.T. As a rule, and in accordance with past experience, the extent of the increase was greater in those guineapigs in which the serum-antitoxin level was low when the antigen was injected.

Restricted Diet

In group 2 one animal (serum-antitoxin 0·25 unit per ml. before injection and 8 units per ml. ten days later) appeared to suffer much less from the restricted diet than any of the others. This was one of the 2 animals in this group which showed the considerable increase in antitoxin which appears to be the normal response to injection of antigen. On the morning of the fourth day after the injection of antigen, however, 9 of the remaining 12 guineapigs were found lying on their sides, and it looked as if they would die before the tenth day, on which the antitoxin titre was to be determined. To avoid this loss of valuable data each of these 12 animals was given, from a pipette, 10 mg. of ascorbic acid in aqueous solution, followed by milk also by pipette; and then they were offered, and rather surprisingly took, washed fresh cabbage leaf; more hay was added to the cages, which were placed on hot-water radiators. In spite of these efforts, however, 5 guineapigs died during the fourth or fifth day, but 7 recovered, very slowly at first but ultimately completely. It is noteworthy that though 7 of these had almost died they all showed an increase in antitoxin titre ten days later; and, though this increase is small and significantly less than in the controls, the response of an established immunising mechanism to specific antigenic stimulus is apparently one of the last of the reactions to be retained.

The sudden severe deterioration in the condition of these animals on the fourth day may perhaps be associated with the fact that this is about the time when the antitoxin titre begins to increase; thereafter the titre rises rapidly and reaches a maximum about the tenth day, and usually an increase in the globulin fraction of the serum-proteins accompanies this production of antibody. Though animals in good condition show no signs or symptoms indicating this changed metabolism, it is possible that, when the call is made on emaciated or debilitated animals, the extra effort is more than the weakened organism can sustain.

It is interesting to compare these results with those of Gell,[3] who showed that, though undernourished German prisoners and hospital patients developed significantly less antibody than a control group of well-nourished British personnel living in Germany, nevertheless these famished people did produce antibody in response to both primary and secondary stimulus.

Subletha l Tetanus

Group 3, each of which had moderate tetanus continuously throughout the period of the secondary response, reacted as well as the control group, their ability to produce antitoxin being apparently in no way impaired.

Indian Ink

It was intended to give group 4 an injection of indian ink every forty-eight hours during the ten days following the injection of antigen. This plan could not be carried out, however, because the indian ink proved too toxic; after the first intravenous injection the animals suffered severe shock, and their recovery was so slow, and for a time seemed so uncertain, that it was decided not to repeat the injection. The antigen was injected about six hours after the indian ink had been given, and the results show that this treatment had little effect on the immunising mechanism.

Control Experiments

It was of some interest to know whether restriction of the diet, of itself, had any effect on the level of circulating antitoxin. Accordingly the antitoxin titre of the 13 guineapigs in group 2 was determined before the supply of cabbage was cut off and again twenty-one days later—i.e., just before the antigen was injected. These exami-

3. Gell, P. G. H. *Ibid*, 1948, 41, 323.

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nations showed that the titre had declined to half the original value in 10 guineapigs and had remained unchanged in 8; and, though there is no evidence that restriction of the diet to the extent described for twenty-one days is accompanied by a pronounced decline in circulating antitoxin, it is equally important to note that the titre does not increase in these circumstances.

It was also shown that neither tetanus nor an intravenous injection of indian ink stimulated the immunising mechanism; the antitoxin titre of those animals in which tetanus was maintained for the period of the secondary response, and that of 4 animals given a single intravenous injection of 0·5 ml. of indian ink, remained unchanged.

CONCLUSIONS

Considering the results of these further experiments with those obtained in earlier investigations, it seems that, though the degree of active immunity produced by the injection of antigen into normal guineapigs is much affected by the diet given before and during the primary response, in animals which have been successfully immunised the secondary response to specific antigenic stimulus occurs in spite of severe dietary restriction. If this restriction is of short duration, the effect on the secondary response is trifling, and it is only after protracted restriction of the diet, under the conditions described here, that antitoxin production is greatly diminished.

The secondary response occurs in immunised guineapigs after protracted exposure to cold, after an intercurrent infection with *Cl. welchii* which caused severe gangrene of the muscles of the leg and persisted for the whole period of the secondary response, after a moderate degree of tetanus produced by the injection of tetanus toxin and persisting for the whole period of the secondary response, and after a single large intravenous injection of indian ink, which proved toxic and caused profound shock.

The ability of the immunising mechanism to respond to subsequent injections of specific antigen under most adverse conditions is an outstanding feature of these investigations.

ACUTE JEJUNITIS

REPORT OF A CASE

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THE publication of a description of necrotic jejunitis by Fick and Wolken [1] prompts me to report a similar case referred by Dr. D. H. Irish, which came under my care two years ago.

An English widow, aged 62, was admitted to the Lister Hospital on March 3, 1947, with signs of acute intestinal obstruction.

She had undergone herniorrhaphy in 1922 and hysterectomy in 1940. Thereafter she had remained well until three weeks before admission, when she had begun to have abdominal pain. This had remained subacute, with intermissions and a feeling of distension. She had been relieved by carminatives to some extent until three days before admission, when the pain had become much more acute, mostly on the left side. The day before she was admitted she had begun to vomit repeatedly but could still pass flatus. There was no diarrhœa, but an enema had produced a fair result. No blood had been passed per rectum.

On examination she complained of severe abdominal pain, mostly on the left side, and looked ill. Her abdomen was considerably distended, but there was no visible peristalsis; no mass was palpable, and bowel sounds were loud and frequent. There was tenderness on palpation, especially in the left iliac fossa, but no rigidity. There was some œdema of the feet and signs in the chest of chronic bronchitis. Her blood-pressure was 160/80 mm. Hg. Acute intestinal obstruction due to adhesions, or a band, following the previous operation was tentatively diagnosed.

Operation.—After the patient had been given two pints of fluid intravenously, her abdomen was opened by a lower midline incision. There was a fair amount of free blood-stained fluid in the peritoneal cavity. The large gut and ileum appeared normal. The jejunum, however, presented an extraordinary appearance. For about a foot it was distended, thickened, and acutely inflamed. The affected part, which was dark red, started abruptly at the duodeno-jejunal flexure, and ended just as abruptly, like the edge of an erysipelas. The mesentery related to it felt thick, hard, and leathery, and showed multiple fissures and excoriations. In fact the appearance of the mesentery was more alarming than that of the bowel. No enlarged glands were seen or felt. On the left side, near the splenic flexure, was a mass of omentum and intestine which could not be properly defined but did not seem to have any direct relationship with the large bowel. It was possibly a sealed off perforation of the jejunum, with abscess formation.

The diagnosis was not clear, but it was thought that it might possibly be a high Crohn's disease, though it seemed too severe for this. One felt sure that the patient was doomed. Resection was out of the question. As a last resort, however, an antecolic gastro-enterostomy was done, the stomach being united to the jejunum several inches beyond the termination of the affected part—i.e., about 18 in. from the duodeno-jejunal junction.

Postoperative Course.—The patient was given further fluids intravenously and penicillin 30,000 units four-hourly for six days. Convalescence was stormy. Fæculent fluid was withdrawn through a Ryle's tube or returned by vomit. Vomiting was intermittent during the next four weeks, but after the first day or two was bilious. The patient gradually improved, but a secondary suture of the abdomen had to be done on March 12, 1947. She was discharged on April 12, having been in hospital for nearly six weeks.

Subsequent History.—All went well for three months, when the patient was referred to me again on July 12, 1947, with acute intestinal obstruction. She stated that she had been in excellent health since leaving hospital. Her condition was now critical. After the usual preoperative treatment laparotomy was done. This time a loop of gangrenous ileum was found strangulated by adhesions. About 21 in. of gut was resected and an end-to-end anastomosis made. The loop was typical of any ordinary obstruction and in no way resembled Crohn's disease of the ileum. The interesting thing, however, was that the jejunum and its mesentery now appeared to be completely normal, and there was no evidence of the mass previously alluded to.

The patient died some nine hours later. No necropsy was performed.

COMMENTS

This case appears to be similar to those described by Fick and Wolken.[1] The age of the patient also corresponds. I have performed laparotomy on two patients with Crohn's disease or regional ileitis (no resection or even short-circuit was carried out, and they did well on chemotherapy). This case resembled them in some aspects. The abrupt demarcation of the affected bowel and its red congested appearance were similar, but the mesentery looked entirely different. It did not contain those bright pink or red fleshy glands that one associates with Crohn's disease. Further, the age-incidence of Crohn's disease is said to be much lower—20–40 years—and was so in my cases.

Nevertheless, in view of the vague and little understood pathology of Crohn's disease, it seems that acute or necrotic jejunitis may be a fulminating manifestation of that disease, and it is questionable whether it is wise to postulate a new disease. Brynjulfsen [2] also holds that acute jejunitis and acute regional ileitis are manifestations of the same disease.

This case is only an isolated one, whereas Fick and Wolken speak of necrotic jejunitis as being endemic in Northern Germany.

1. Fick, K. A., Wolken, A. P. *Lancet*, March 26, p. 519.

2. Brynjulfsen, B. C. *Acta chir. scand.* 1948, 96, 361.

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It is to be noted that this patient recovered from the acute jejunitis, and there was no sign that the jejunum had ever been abnormal three months after a short-circuit operation. Her death was indirectly due to it because of intestinal obstruction by adhesions, but this was more a mechanical misfortune than anything else. The possibility of such a fatality is mentioned by Fick and Wolken.

Finally, it seems that for acute jejunitis or acute regional ileitis a short-circuiting operation, or even conservative treatment with chemotherapy, is likely to be successful unless perforation has occurred.

HORMONE TREATMENT OF THE SEXUAL OFFENDER

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THE Criminal Justice Act, 1948, has emphasised the duty of the community to provide treatment for the habitual sexual offender.

The want of success that so often attends attempts at psychotherapeutic reform of habitual sexual offenders has led to a widespread demand that they should be castrated, and not a few offenders whose lives have been made miserable by inability to control their sexual impulses have insistently demanded surgical sterilisation. Though "voluntary castration" is allowed in certain States, and the advisability of compulsory sterilisation has been debated in others, it is by no means clear that the performance of a mutilating operation, whether at the request of a culprit anxious to avoid further misconduct or in obedience to a sentence of the criminal law, is in any sense a medical obligation.

This consideration is by no means the only one that may give pause before such measures, either "voluntary" or compulsory, are accepted by the law. It is often assumed that libido inevitably disappears on castration; but there is much evidence that in man the sexual urge may persist for years after it. Rowe and Lawrence (1928), Thorek (1924), and Hamilton (1943) have reported cases of persistence of sexual behaviour for many years after castration. McCullagh et al. (1933) have brought additional confirmatory evidence. Classical literature—e.g., Juvenal—furnishes ample evidence of the persistence of potency in healthy young slaves castrated for the erotic demands of Roman society. Nor is such persistence confined to the human castrate; experiments on animals afford examples of persistent libido in every type of animal. There is, however, no evidence about the cause for this apparently irregular effect of castration on the libido. In some persons, then, a reflex pattern of sexual behaviour survives in the central nervous system and suffices to innervate the penile mechanisms; and, where a pre-existing erotomania has impaired voluntary control, it might well be that a sexual criminal after compulsory or voluntary castration would continue to be a social nuisance (cf. Stürup 1948).

ŒSTROGENS AND LIBIDO

Dunn (1940) induced a male sexual offender, undergoing imprisonment for repeated convictions, to consent to an attempt to abolish libido with stilbœstrol.

The man received stilbœstrol 5 mg. daily for 60 days until 300 mg. had been given, then 5 mg. every other day for 36 days. He received in all 480 mg. of stilbœstrol in 96 days and no toxic effects were noted. After 75 days' therapy a swelling was felt below each nipple, and subsequently well-marked gynæcomastia developed. At the end of the treatment there was a complete absence of libido, and double testicular biopsy showed degenerative changes.

Foote (1944) treated a sexual psychopathic patient with stilbœstrol 1 mg. daily.

After 30 mg. had been given, masturbation ceased and the sexual preoccupation disappeared. During the treatment the breasts became enlarged and tender. After the treatment had been stopped the effects lasted for a fortnight, and then signs of regression appeared, and after 32 days there was a complete relapse, which again yielded to further treatment with stilbœstrol.

Our attention was first called to the possibility of inhibiting libido by hormone treatment by a series of cases of acromegaly treated at the Burden Institute with very large doses of œstrone.

This method of treatment, which we owe to Kirklin and Wilder (1936), aims at the reduction of the pituitary adenoma by overwhelming doses of œstrone. Hutton and Reiss (1942) treated a case of acromegaly with injections of œstrone 100,000 I.U. daily. The patient, a well-built vigorous man, exhibited after a couple of weeks' therapy a complete absence of libido, together with some degree of gynæcomastia.

Of acromegalic patients treated in similar fashion, five were males, and as the pituitary adenoma regressed, all these patients noted a complete loss of sexual power, accompanied by softening of the testicles and gynæcomastia. Attempts to substitute large doses of stilbœstrol for œstrone were unsuccessful, chiefly because stilbœstrol in large doses readily causes unpleasant toxic symptoms. It must be noted that, when progressive impairment of vision and severe headaches called for urgent treatment, the colossal doses of œstrone used could not be safely paralleled in stilbœstrol therapy.

In all the male cases of acromegaly treated with œstrone libido had practically vanished after the first fourteen days. Cessation of the treatment after various periods was followed by a return of libido in about two weeks; but in observations lasting as long as six years it has been found that libido was absent so long as maintenance doses of œstrone were continued. In two such cases injections of testosterone propionate 25 mg. three times weekly restored sexual potency while the œstrone treatment was continuing. There is thus no reason to believe that even after years of œstrone treatment sexual power is permanently abolished.

TRIAL OF THE TREATMENT

Encouraged by these observations we decided to offer a course of hormone therapy to abolish libido temporarily in persons complaining of an uncontrollable sexual urge that had led to trouble.

Up to now thirteen such persons have been treated. In all cases the treatment has been completely successful in abolishing libido. In most of them we have not used the colossal doses of œstrone given in acromegaly, where a prompt reaction is needed to save sight and alleviate suffering. Where, however, for psychological reasons a prompt abolition of libido within the first fortnight is desired, this can generally be effected with injections of œstradiol benzoate 50,000 I.U. daily. In many cases it was found that, if œstrone 50,000 I.U. daily was substituted for the œstradiol injections, libido could be abolished within a month.

The treatment should be discontinued only when a restoration of libido is judged to be safe and desirable. In the treatment of acromegaly with œstradiol injections we found that, even after so long a period as four years, during the whole of which time libido had been absent, intermission of the treatment was followed by a return of libido within three weeks. It is not, however, necessary to continue the treatment at its initial dosage after the first six weeks, and œstrone 20,000 I.U. daily by mouth is sufficient.

Our experience in the treatment of acromegaly with stilbœstrol preparations was on the whole unfavourable

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to the use of the cheaper remedy when it is desirable to administer the equivalent of the enormous doses of œstradiol used to obtain an early result. It is, however, possible that stilbœstrol preparations may be used with effect in the abolition of libido where the need for early therapeutic results is not so urgent.

The fact that libido was rapidly removed in all our thirteen cases, whereas after castration it may persist in an appreciable number for various periods, suggests that the effective action of œstrone treatment is not confined to its direct action on the testicle.

In view of the non-mutilating nature of this treatment and the ease with which it can be administered to a consenting patient we believe that it should be adopted whenever possible in male cases of abnormal and uncontrollable sexual urge.

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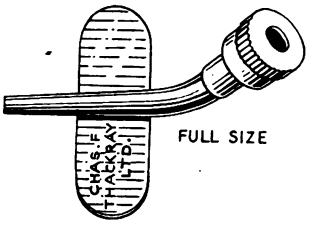
New Inventions

MODIFICATION OF GORDH'S NEEDLE FOR REPEATED INTRAVENOUS INJECTIONS

Gordh's needle has proved very useful in anæsthesia for repeated intravenous injections, but it has the following disadvantages: (1) the needle may be too large for easy insertion into a small vein, especially in children; (2) the point in time becomes blunted; and (3) sometimes it is not easy to be sure that the needle is in the vein without removing the cap, which takes time.

The following modification, which allows any selected needle to be used, overcomes these disadvantages. The diagram is self-explanatory. The adapter is made similar to the Gordh type except that, instead of having a needle permanently incorporated in it, there is a 'Record' fitting which allows a needle of any size to be attached. The usual method is to insert a suitable sized needle (gauge 23–21) into a vein, bearing in mind that there is less chance of clotting with the larger needles. When venous blood appears from the needle, a preliminary dose of thiopentone or thiopentone-curare is injected from a syringe. The syringe is next removed, and in its place the adapter is attached and fixed in position with adhesive tape. A further injection of thiopentone or of water is given immediately through the rubber diaphragm to ensure that the needle is free from blood. Further injections of thiopentone or of curare are given as required. If 'Tubarine' is used, water should be injected between the thiopentone and the tubarine to prevent precipitation. A very fine needle (gauge 26) is used for injecting through the diaphragm. This lessens the chance of dislodging the diaphragm and prolongs its life.



If remote control is desired, the adapter can be extended by inserting several feet of narrow-bore pressure tubing, with appropriate record fittings, between it and the needle.

Messrs. Chas. F. Thackray Ltd., of Leeds, made the adapter for me.

ALEX. C. FORRESTER, M.B. Glasg., D.A.

Reviews of Books

Medicine

Vol. II. *Diagnosis, Prevention and Treatment.* A. E. CLARK-KENNEDY, M.D. Camb., F.R.C.P. Edinburgh: E. & S. Livingstone. 1949. Pp. 385–894. 25*s*.

WHEN the first volume of this work was published in 1947 we prophesied that when complete it "should be the most unorthodox treatise in medicine that our generation has seen." The second volume amply fulfils the promise of the first. The style is clear and concise and passes the acid test of good composition—the effortless projection into the mind of the reader of a succession of vivid images. Occasional minor imperfections, especially in therapeutics, to which the carping critic might point, are without significance for the main theme. Clinical diagnosis is shown to be the application of the basic sciences to individual examples of illness, and the balance held in the use of laboratory methods in clinical practice discloses the breadth of outlook and reasoned integration of the general physician. The chapters on Reaction of the Mind and The Practice of Medicine stand out not only for their content of sound common sense but for the knowledge they give us of the mind and character of the author. Unconsciously he reveals his idealism and his insight into human frailty, with a freedom from the cynicism all too common in this age of moral and intellectual confusion.

This is a book which should be read and reread by students of medicine to the end of life, and particularly by those who feel that in the intensive pursuit of a specialty they have lost their sense of proportion. Much of it will never become out of date, for it deals with problems which will beset Man until the end of time, and it conceives of the good physician as shouldering the responsibility for the care of his patient not only in his physical distress but also in his mental and social unhappiness.

Elements d'Anthropologie

CLAUDE CHIPPAUX, médecin-commandant du Corps de Santé Colonial, professeur agrégé de l'École d'Application du Service de Santé des Troupes Coloniales. Marseilles: École d'Application du Service de Santé des Troupes Coloniales. 1949. Pp. 158. Fr. 600.

THIS short and admirably plain manual on physical anthropology is clearly intended for the use of medical officers in the French Colonial Empire. It covers only the field investigation of living races; the first part describes what features the observer should look for and measure, and the second part tells him how to set about doing this. A short classification and description of living races and sub-races ends the book. The characteristics noted are all the traditional ones—colour of skin and eyes, shape of nose and lip, ear form, genitalia, steatopygy. The measurements are the usual ones, and the method of taking each is described as clearly as is possible without any exemplifying diagrams or photographs. There is a rather uncritical section on physiological measurements, and one on comparative racial pathology. Surprisingly, the blood-groups are scarcely mentioned, and the technical field methods of collecting and packing blood for subsequent grouping at a metropolitan centre is omitted entirely; nor are photographic techniques discussed. In short, this is a good member of that class of instructional handbooks pressed upon missionaries and slipped in the pockets of ethnographers some twenty or thirty years ago by optimistic anthropologists. This is not to decry the author's work: the doctor proceeding overseas would certainly learn something by looking at it before he leaves. Dr. Chippaux's intention, however, is not as clear as his writing: under his guidance, the doctor will probably take the measurements correctly, but he will have to find out from some other source why he is doing so. Nevertheless, until the physical anthropologists in this country produce a really up-to-date and easily accessible booklet covering the same ground, and giving the reader an outline of the questions his data are intended to answer, it is impertinent for us to throw stones.

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Contributions to Psycho-Analysis 1921-1945

MELANIE KLEIN. With an introduction by ERNEST JONES, M.D. London: Hogarth Press. 1948. Pp. 416. 21*s*.

Dr. Klein's book is a contribution to psycho-analysis proper—that is, to the Freudian system of thought. Its audience is not the layman, or even the psychiatrist of other denomination. Such an outsider, eavesdropping at an essentially domestic discussion, is continually stimulated to question assumptions and points of view in terms of a different system—roughly, his own. This would be illegitimate. Criticism, to be valid, must point to the internal inconsistencies of the system used and expressed, and not merely carp because that system is not what the critic would have. To criticise Dr. Klein thus legitimately would require a familiarity with Freudian doctrine and neo-Freudian developments comparable with that of Dr. Klein herself. It is patent at least, that these eighteen papers—delivered before various psycho-analytical societies—are the work of a forceful controversialist of high intellectual calibre, who is attempting with great conscientiousness and considerable acumen to extend and amplify Freudian concepts in the field of child analysis. She uses details of cases observed and treated by herself—clinical material of value to all. She argues intricately. Psycho-analysts will appreciate the permanent recording of the thoughts of one whose stature places her on terms with the best that psycho-analysis has given us.

Stephenson's Incompatibility in Prescriptions

(5th ed.) Editor: JAMES BURNET, M.A., M.D., LL.B., formerly lecturer on diseases of children, School of Medicine of the Royal Colleges, Edinburgh. Edinburgh: *The Prescriber*. 1949. Pp. 62. 10*s*.

INCOMPATIBILITY is a bogy which haunts the undergraduate but seldom troubles the experienced practitioner. This may seem odd until it is remembered that the student's little learning in chemistry may serve only to make him excessively apprehensive. The practitioner comes to realise that the sense of inadequacy that oppressed him in his student days was akin to Elia's "Witches and Other Night Fears." Resplendent pills which in a few short hours revert to a disgusting amorphous mass; mixtures endowed with explosive qualities, and others displaying kaleidoscopic changes of colour or—greatest indignity of all—converting themselves into mountains of white froth; these and similar calamities are no longer numbered among the doctor's nightmares. He has sought and found refuge in the gospel of simplicity; and he receives official encouragement in his distrust of the "elegant" prescriptions whose numerous ingredients are reminiscent of a recipe for an old-fashioned Christmas pudding. The pity is that such prescribing was ever permitted the lofty designation of an art, when it is clearly an undesirable form of sublimated exhibitionism. The adversity of war and the austerity born of victory have taught the wholesome lesson of discrimination in prescribing; and incompatibilities are correspondingly rare, for clear thinking and intellectual honesty are as essential to the prescriber as to the diagnostician. But this is not to say that the problem of incompatibility does not exist. In his readable little book on the subject Dr. Thomas Stephenson devotes twenty pages to a discussion of general principles which should go far to protect the physician from serious errors. The rest of the book consists of an alphabetical list of drugs with useful data on doses, solubilities, and incompatibilities, adding to its value as a work of reference.

Studi e Ricerche sulla Manna e Mannite Naturale

DOMENICO GIGANTE. Rome: Istituto Poligrafico dello Stato. 1948. Pp. 139.

HEXAHYDRIC alcohols have been known for many years and their physiological properties have been investigated from time to time. They are known to be absorbed slowly, and in big doses incompletely, and to be largely, if not entirely, excreted unchanged in the urine. Some of them have been advocated as sugar substitutes for diabetics; and mannitol has recently been used extensively to measure glomerular filtration-rates (G.F.R.). Gigante has restudied some of the known physiological properties of mannitol, which is easily obtained in Italy, and he has made some new observations.

Many of his findings seem to have been a result of the slow absorption and osmotic activity of mannitol. Thus he has produced radiological evidence that duodenal instillation of mannitol is followed by contractions of the gall-bladder, and he has extensively studied its laxative properties. Similar effects, however, have long been known to follow the administration of substances, such as magnesium sulphate, which are osmotically active and slowly absorbed. He also showed that oral administration of mannitol checked water diuresis in man, no doubt as a result of retention of water in the gut; but it seems somewhat rash to have concluded that this substance has no diuretic effect in man, for its properties suggest that in moderate doses it almost certainly must have, and Gigante himself found that injections of mannitol increased the urinary output of mice. He makes no mention of the use of mannitol to measure G.F.R.

At the end of the book there is a list of prescriptions for laxative remedies, and recipes for diabetics, all made up with mannitol; and there are many good references to previous work on these polyhydric alcohols. A book of this kind will necessarily have a limited circle of readers, but it may be of some interest to dietitians.

Cardiovascular Disease in General Practice (3rd ed. London: H. K. Lewis. 1949. Pp. 218. 15*s*.).—"A little book," is the term applied by Dr. Terence East to his monograph; but it is packed with information, given in a condensed staccato style which is rather difficult to absorb. The meaning however is in general very clear, though an even more definite presentation of the author's own views, with omission of much conflicting opinion, would be justified in an elementary book. Some signs whose origin is uncertain are perhaps given undue attention (for example, the apical systolic murmur; whereas the characteristic quality of the murmur of mitral stenosis is not mentioned, perhaps because it is so well known). In all sections, the approach to the subject is essentially practical, and the whole field is covered with due emphasis on fundamentals and common disorders. The book may be strongly recommended to those for whom it is written.

Structure and Function as Seen in the Foot (2nd ed. London: Baillière, Tindall, and Cox. 1949. Pp. 333. 25*s*.).—Only three pages longer than its predecessor, the new edition of this book by Prof. Frederic Wood Jones, F.R.S., remains an agreeable size for reading and is even better supplied with clear and pleasing diagrams. He writes as always with one eye on man and the other on the rest of the vertebrates; and every now and then cool exposition is interrupted with aphorisms ("... surgeons have been disposed to value the toes too lightly") or unusually striking similes ("the blood is squeezed upwards ... as it might be by the contractions of a series of bulbs on a Higginson's syringe"). Moreover he has the story-teller's gift of promising a surprise (even about something like the divorce of the flexor digitorium brevis from its fleshy belly: "there is far more interest in its story than is implied in this apparently simple explanation"). Anatomy can seldom be read with so much pleasure as in his books.

Forensic Medicine (9th ed. London: J. & A. Churchill, 1949. Pp. 659. 30*s*.).—Sir Sydney Smith, now reinforced by Dr. Frederick Smith Fiddes, has presented us with yet another edition of his famous textbook. The text has been revised and some of the illustrations have been replaced. The rhesus factor, which promises to have considerable medicolegal importance in paternity cases, is reviewed in two intricate pages. "As the basic hypothesis becomes more firmly established," write the authors, "the tests are bound to become more widely applicable and legally acceptable." How the facts are to be made acceptable to the bench is a problem in exposition which lawyers should relish. No attempt has been made in this edition to cover the National Health Service Act, but some reference is made to the National Insurance (Industrial Injuries) Act, 1946. The appendix on detection of poisons has been retained in view of its value in parts of the world where fuller works of reference are scarce; while the section on war gases has been omitted—"perhaps optimistically," the authors suggest.

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THE LANCET

LONDON: SATURDAY, JUNE 11, 1949

American Work on Venereal Diseases

PERHAPS we do not sufficiently acknowledge our debt to the United States for most of the recent advances in the diagnosis and treatment of the venereal diseases. Research in this subject has been neglected here; and, though important contributions have been made in treatment, these have been by-products of other investigations, and their application to the venereal diseases has mostly been studied elsewhere. In America the development and coördination of this research began during the war, under the direction of the Committee on Medical Research of the Office of Scientific Research and Development, and was continued after 1945 by the U.S. Public Health Service through the Syphilis Study Section of the National Institute of Health. Dr. JOSEPH EARLE MOORE, who has been chairman of this section for some years, summarised recent advances, resulting from work in his own and other clinics, in an address last week to the section of experimental medicine of the Royal Society of Medicine and the Medical Society for the Study of Venereal Diseases.

Dr. MOORE believes that further progress in the study of the biology of syphilitic infection and of immunity reactions depends on success in cultivation of *Spirochæta pallida* on artificial media. This is necessary also for the development of a truly specific diagnostic test and perhaps of more certain standards of cure. NEWCOMER and HANNES, he said, have now succeeded in causing cultured non-virulent spirochætes of the Nichol's strain to multiply rapidly in anaerobically incubated fertile hens' eggs killed by asphyxiation immediately after inoculation, and organisms so cultivated revert to the typical appearance of virulent spirochætes. BOAK and CARPENTER,[1] using virulent *Sp. pallida* from infected rabbits, have prolonged the survival of these organisms in the original inoculum of a special medium for as long as ninety-seven days, and, at the same time, have transferred subcultures through at least five generations, with the probability that actual multiplication has occurred. In studying immunity NELSON and MAYER[2] have shown that the blood-serum of syphilitic men and rabbits contains an antibody which immobilises and probably kills virulent *Sp. pallida*. This antibody appears to be distinct from "reagin," the factor on which the ordinary serological tests for syphilis depend; it was absent from the sera of normal men and rabbits and also from the sera of a number of patients with infections other than syphilis, but was present in spinal fluid from syphilitic patients. This test remains experimental and is unlikely to be developed for routine purposes until the virulent *Sp. pallida* has been successfully cultivated. The method holds great promise for the differentiation of so-called biological false-positive serum reactions from those actually due to syphilis. For routine serum tests interest has been centred on cardiolipin, which is a highly purified phospholipoid having antigenic properties in the presence of lecithin and cholesterol. It offers hope of a test more sensitive and more specific than those for which the antigen is derived from beef-heart extracts.

Procaine penicillin G, Dr. MOORE said, has now replaced the oil-wax suspension for the treatment of ambulant syphilitic patients. It may be suspended in water, or in oil to which is added 2% of aluminium monostearate which repels water.[3] The oily suspension provides measurable serum levels of penicillin for a slightly longer average time than the aqueous suspension. A single dose of 0·6 mega unit of the oily suspension provides a serum-penicillin level of 0·03 or more units per ml. for five to seven days. This preparation is virtually non-toxic and has almost replaced ordinary penicillin, so that the treatment of syphilis is now almost entirely ambulatory. For early syphilis the dosage commonly used is 6 mega units of procaine penicillin G given in ten intramuscular injections. The injections are given daily or every second or third day. By analogy with results obtained with the oil-wax suspension it is anticipated that such treatment will give a failure-rate of 10–15% after observation for eighteen to twenty-four months. At the present time several clinics are testing the effect of a much shorter course of treatment—e.g., a single injection of 0·3 mega unit; a single injection of 1·2 mega units; two injections of 1·2 mega units at an interval of seven days; and three injections of 1·2 mega units at intervals of seven days. The preliminary results are encouraging and it seems possible that eventually syphilis will be cured by a single injection. MAGNUSON, EAGLE, and FLEISCHMAN, and CUMBERLAND and TURNER, working independently and with different technical methods, have adduced evidence that the time required, in the rabbit, for *Sp. pallida* to produce by division a second generation is thirty to thirty-three hours. If this applies to man, the maintenance of a continuous blood-level of penicillin may prove unnecessary.

ALEXANDER, SCHOCH, et al. and PLOTKE, EISENBERG, et al. have studied the possibilities of "abortive" treatment of syphilis in man. Patients exposed sexually to persons with proved infectious early syphilis were divided into a control group of 215, to whom no treatment was given, and 297 who each had a single injection of 0·6–0·9 mega unit of procaine penicillin as soon as the diagnosis was

1. Boak, R. A., Carpenter, C. M. Summary of Studies on the Isolation of *T. pallida*, presented at a joint symposium of the Syphilis Study Section, National Institutes of Health and American Venereal Disease Association, Washington, April 7, 1949.

2. Nelson, R. A., Mayer, M. M. *J. exp. Med.* 1949, **89**, 369.

3. See *Lancet*, May 21, p. 872.

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established in the contact—i.e., after periods varying from a few hours to several weeks after exposure. After observation for periods up to eighteen months, 115 patients in the control group (53·4%) had developed early syphilis, compared with 16 (5·4%) in the treated group; the treatment therefore gave a tenfold reduction in the incidence of syphilis. Dr. MOORE regards this procedure of prophylactic or early abortive treatment as now well established. Most of the failures in the series described could be attributed to possible reinfections, for the majority of the patients concerned had had later exposures without precautions.

HOEKENGA, BUERK, and RIDER,[4] of the Johns Hopkins Hospital, have studied in 16,000 patients the relation between clinical failure and response of the blood-serum reactions in the first year after the treatment of early syphilis. The incidence of clinical relapse was low (7–9% after three years) when the serum tests remained negative or became negative and remained so. It was low also (12% after three years) when the titre of the serum test fell to a low level but remained weakly positive. On the other hand, clinical relapse was frequent when the positive serum reactions persisted in high quantitative titre for six months or more (30% after eighteen months), and when sero-relapse occurred (75% of clinical relapse after eighteen months of observation). These findings emphasise the importance of making repeated quantitative serological tests on all patients after treatment for early syphilis, so as to anticipate clinical relapse. This work may also prove important in helping to differentiate between relapse and reinfection.

Further experience has confirmed the view that penicillin administered to the pregnant syphilitic woman gives almost certain protection to the fœtus. In several thousand cases, failures resulting in the birth of syphilitic infants were only 1–2%, which contrasts with a failure-rate of about 25% in the days of metal chemotherapy. In the past it has been generally accepted that syphilitic women should be treated during every subsequent pregnancy, whether apparently cured or not. GOODWIN and FARBER[5] studied 363 women, with syphilis in various stages, during 570 pregnancies after antisyphilitic treatment with metal chemotherapy. Treatment was deliberately withheld during these pregnancies, but not one of the infants developed syphilis. TUCKER,[6] THOMAS,[7] and INGRAHAM[8] each studied a group of women who had been treated with penicillin for early syphilis and who were not treated during subsequent pregnancies. The total number of pregnancies which they observed was 390, and 3 (0·77%) syphilitic infants were born. The conclusion drawn is that it is unnecessary to treat a syphilitic woman during every pregnancy. It is arguable, however, that treatment with penicillin is so simple, brief, and safe that even the slight risk which remains when a mother is free from signs and serologically negative after adequate treatment need not be taken.

4. Hoekenga, M. T., Buerk, M. S., Rider, R. V. *Amer. J. Syph. Gon. ven. Dis.* (in the press).
5. Goodwin, M. S., Farber, M. S. *Ibid*, 1948, **32**, 409.
6. Tucker, H. A. *Ibid*, 1949, **33**, 1.
7. Thomas, E. W. *Bull. ven. Dis. Mass. Dep. publ. Hlth*, 1948, **1**, 11.
8. Ingraham, N. R. jun. *Amer. J. Med.* 1948, **5**, 693.

No harm was observed from the penicillin treatment of several thousands of patients with cardiovascular syphilis, and it seems that the Jarisch-Herxheimer reaction is not to be feared. In Dr. MOORE's view the apparent Herxheimer reactions occasionally reported may be no more than chance occurrences. On the other hand, there is no evidence that penicillin is of appreciable benefit in prolonging life in syphilitic aortitis with complications. Pending further evidence on this point, it is probably legitimate and desirable to use penicillin in such cases. In neurosyphilis penicillin seems to be even more effective than for early syphilis: the results are excellent, judged both clinically and by the reversal of positive tests of the cerebrospinal fluid, and the benefits once attained seem to be permanent in at least 90% of the cases. It has still to be determined whether penicillin alone is as good as penicillin combined with fever therapy, but opinion in the United States is swinging towards the view that penicillin alone, in dosage of 6–20 mega units over a period of ten to twenty-five days, achieves as much as fever therapy, and much more than was ever possible with metal chemotherapy. In addition, risks are almost eliminated. There is still a tendency to combine penicillin with fever for those types of neurosyphilis which endanger life or vital functions—e.g., general paralysis, primary optic atrophy, nerve deafness, Erb's spastic paraplegia, and many cases of tabes dorsalis.

The Jarisch-Herxheimer reaction has been closely investigated. Evidently the extent of the response does not depend upon the dose of the drug which provokes the reaction: with minute doses of penicillin (10 units per kg., or less) the reaction does not occur, but once it is provoked its severity is independent of the size of the dose—the "all or none" phenomenon. It appears to be unrelated to the destruction of spirochætes, for in early syphilis febrile reactions may follow single doses of penicillin so small as to have no obvious spirochæticidal effect. In syphilis of the central nervous system the reaction varies greatly with the type of involvement: it was seen in 95% of a group of patients with active general paralysis but in only 25% of a group with neurosyphilis of other types. Here, too, as in early syphilis, the reaction is an "all or none," and cannot be prevented by using small doses initially. In fact the use of small doses has disadvantages, for they may provoke a series of such reactions. Dr. MOORE's own experience has been that Herxheimer reactions have not been troublesome in neurosyphilis except in patients with general paralysis. About 10% of these have developed potentially serious reactions such as cerebral thrombosis or exacerbations of psychoses within the first two to three days of treatment. He recommends that in these cases fever should be given first and penicillin added when the effect of the fever is established.

In the treatment of gonorrhœa no evidence of penicillin resistance has yet appeared. Procaine penicillin is regarded as curative in at least 95% of cases when given in a single intramuscular injection of 100,000 units. Cure is regarded as so nearly certain that in most large American clinics follow-up smears and cultures have been abandoned. Speaking

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of antibiotics, other than penicillin, Dr. MOORE reported that aureomycin has been found effective in some degree against all the venereal diseases in which it has been tested—gonorrhœa, chancroid, lymphogranuloma inguinale, granuloma venereum, and syphilis. For gonorrhœa it has been administered by mouth in two or three divided doses, each of 250–500 mg. It has a possible future in the treatment of penicillin-resistant cases, but because of its effect upon syphilis it should probably be avoided for the routine treatment of gonorrhœa. On the other hand, streptomycin in single intramuscular doses of 0·5–1·0 g. seems to cure gonorrhœa in 90–95% of cases without any danger of masking or suppressing syphilis. For lymphogranuloma inguinale aureomycin is given by mouth in doses of 250 mg. four times daily up to a total of 20–40 g., and is likely to be more successful than any other preparation tried so far. For granuloma venereum similar dosage by mouth is as effective as streptomycin. Though active against syphilis both in experimental animals and in man, aureomycin is probably much less so than penicillin.

Dr. MOORE's review of the American work and experience was full of valuable information and food for thought. It is to be hoped that our own contributions to these important investigations will be made in due course, though the scale of inquiry may have to be smaller.

Therapeutics of Vitamin E

WHEN EVANS and BURR [1] and other American workers proved that vitamin E is necessary for successful reproduction in rats they can hardly have anticipated that 25 years later their new vitamin would be hailed as a panacea for a wide variety of human diseases unrelated to reproduction. Even less can they have expected that investigations which were begun in the calm atmosphere of academic research would lead eventually to controversies so heated as to burst forth under headlines in the popular press.

The value of vitamin E in the treatment of human diseases has been strongly urged for many years by Dr. EVAN SHUTE, of Canada.[2] His early investigations suggested that the vitamin, then obtainable only as wheat-germ oil or its concentrates, was beneficial in emergencies of pregnancy, such as abruptio placentæ or premature labour. Later he has used pure α-tocopherol in the treatment of large numbers of patients with cardiac and vascular diseases not associated with pregnancy, and has claimed highly successful results. Some clinicians have confirmed his findings, at least in part, but many critical workers, including several in this country, have noted no good effects after tocopherol therapy in the diseases mentioned. Others have commented that, in the absence of controls given placebos SHUTE could not justifiably claim that his "cures" amounted to more than natural recoveries or remissions. In spite of this weight of criticism, and questions by the governing body of medicine in Ontario, the brothers E. V. and W. E. SHUTE have remained fully convinced of the curative power of the vitamin, and have expressed their confidence by inaugurating the Shute Foundation for Medical Research in London, Ontario. In a letter [3] to the *Canadian Medical Association Journal*, written in collaboration with Dr. A. VOGELSANG who recommends tocopherol in the treatment of diabetes, they have protested vigorously against the rejection of a paper on the treatment of heart diseases which was submitted for publication. "Official Canadian medicine," in their opinion, "is making itself ridiculous in the eyes of the world" by its failure to accept their conclusions. They compare themselves with LISTER in meeting opposition to their discoveries, which they consider to be "incomparably more significant to the general weal than Banting's." For full measure they place tocopherol on the same level of therapeutic importance as penicillin and B.C.G., and finally they describe it as "the atom bomb of modern medicine." Such far-reaching claims inevitably attracted the attention of the lay press, and on Feb. 20 the *Sunday Express*, announcing "a medical discovery as great as insulin," mentioned that questions had appeared on the order paper of the House of Commons about the attitude of the Ministry of Health to α-tocopherol. The decision to class this vitamin among the substances regarded as non-essential for the health of the community was criticised as placing an obstruction against the use of a drug which had already, according to "the testimony of physicians," saved the lives of several important persons in this country. Out of 9000 Canadian doctors 4000 were stated to be already prescribing tocopherol. In view of its alleged value in angina pectoris, kidney diseases, and Buerger's disease it was urged that no further restrictions should be placed on its import or on its manufacture for home consumption.

With opinion so sharply divided it was fortunate that SHUTE and his colleagues had an opportunity of facing some of their critics at the recent International Conference on Vitamin E. Organised by Dr. KARL E. MASON, under the auspices of the New York Academy of Sciences, this gathering brought together experts on vitamin E from scientific, medical, and veterinary angles from all parts of the world. The Canadian workers again pressed their claims that tocopherol is effective in the treatment of heart diseases, vascular diseases such as arteriosclerosis, thrombophlebitis, and Buerger's disease, and burns and frost-bite. Various other workers claimed that rheumatic joint lesions, choreiform movements in rheumatic children, Dupuytren's contracture, Peyronie's disease of the penis, stasis dermatitis and ulceration, urethral stricture, and diabetes were often favourably influenced by α-tocopherol, though with one exception no control experiments appear to have been undertaken. On the other hand, controlled experiments by TRAVERS and her colleagues, by DONEGAN, and by BAER, HEINE, and GELFORD all failed to confirm that vitamin E has any beneficial effect on heart diseases, as measured by objective criteria such as serial electrocardiograms, orthodiagrams, exercise-tolerance tests, or blood-pressure readings. To explain these negative results SHUTE has accused his critics either of not attaining the high rate of dosage, 300 mg. daily, which he finds necessary, or of using preparations of toco-

1. See Evans, H. M., Burr, G. O. Memoirs of University of California. 1927; vol. VIII.
2. Leading article, *Lancet*, 1948, ii, 857.
3. Vogelsang, A., Shute, W. E., Shute, E. V. *Canad. med. Ass. J.* 1948, **59**, 585.

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pherol in which the most active α modification is only a minor constituent. These objections might possibly apply to the earlier attempts to confirm his findings, but they can hardly hold for more recent trials. Another possible explanation of the diverse opinions held in different localities, put forward by HICKMAN,[4] is that the diet contains much less vitamin E in Canada than in Great Britain or in those parts of the U.S.A. where the beneficial action of the vitamin has not been confirmed. Impatient sceptics may well reply that SHUTE's conclusions are not convincingly supported by the evidence which he himself adduces, and that the true explanation of the diversity of the reported results lies only in the rose-tinted spectacles through which SHUTE is presumed to measure the progress of his patients. Before vitamin E is permanently condemned as valueless in the treatment of human diseases, however, time should be allowed for the knowledge which has already been gained in animal experiments to be systematically applied in controlled clinical tests. Thus the proceedings at the International Conference emphasised that deficiency of vitamin E causes a wide assortment of lesions, including muscular dystrophy and nervous degeneration, vascular abnormalities, and an increased liability of the liver to damage during protein deficiency. It would be unfortunate, therefore, if the incredulity provoked by SHUTE's disputable claims and the publicity accorded them in the lay press extended to the well-authenticated scientific advances achieved by many other workers. Whether any benefit is to be derived from the administration of vitamin E to man, and in what circumstances, will be decided only by calm and patient work both in the laboratory and in the hospital.

Platelets and Blood-clotting

STUDIES of blood-clotting have always been peculiarly liable to distortion by the technical devices employed; the necessity for using anticoagulants to obtain blood with which to work has introduced all manner of fallacies and often complicated matters still further. One of the problems that has caused endless discussion is the rôle of the blood-platelets. The classical theory was that the platelets were the main source of the thrombokinase that, with ionised calcium, converted prothrombin to thrombin and so set clot formation on its way. Therefore, if blood could be freed of platelets, it should be incoagulable. The successful performance of this experiment has so far been frustrated by the great difficulty of preventing human blood from clotting while being handled, particularly while being centrifuged to free it from platelets. The technical side of this task seems to have been solved by JAQUES and co-workers[5] who described methods of coating glassware, syringes, and needles with an inert plastic material called 'Silicone' that provided a non-wettable surface. With apparatus treated in this way it was possible to obtain a fluid plasma without anticoagulants. By centrifuging such plasma at speeds of 7000–14,000 r.p.m. CONLEY et al.[6] have obtained human plasma free or almost free from platelets and have studied its properties.

When this platelet-free plasma was stored in silicone-coated tubes, clotting occurred only after a long time—in fact, it appeared that if the silicone coating was really well done the plasma was more or less incoagulable. In glass tubes the plasma did clot in a relatively short time, but the clotting process was not normal because there was hardly any consumption of prothrombin in the process. The addition of platelets increased the amount of prothrombin consumed in clotting, and the relation between prothrombin consumption and platelet-count was quantitative. The plasma had not lost its power of clotting, because addition of even a much diluted active thromboplastin caused prompt clotting with normal prothrombin consumption in both silicone-coated and glass tubes. This "platelet-free" plasma was put into a blood-counting chamber and the clotting process was watched. Clotting began first on the coverslip surface and not near the etched lines, and fibre formation seemed to begin quite independently of any platelets, if a few of these happened to be present. From these and other results CONLEY and co-workers conclude that there is an inactive thromboplastin precursor in plasma that is activated on contact with glass surfaces. The same conclusion was reached by QUICK[7] and by BRINKHOUS[8] from their studies of normal and hæmophilic blood. QUICK pointed out that when hæmophilic plasma does clot in the presence of normal numbers of platelets the clotting is delayed and there is no detectable consumption of prothrombin. This is just like the clotting of normal platelet-free plasma. Again, both hæmophilic platelet-containing plasma and normal platelet-free plasma will clot promptly when active thromboplastin is added. Hæmophilic platelet-free plasma will not clot spontaneously at all in glass or silicone-coated tubes. The inference from all these results is that both platelets and plasma factor are necessary for normal clotting, and hæmophilic plasma is lacking in this plasma factor which QUICK calls "thromboplastinogen." Further interesting results were obtained by studying the plasma of patients whose hæmorrhagic diathesis had been traced to the presence of a circulating anticoagulant.[9] The plasma of these patients could be clotted promptly by adding much diluted potent thromboplastin. A reasonable explanation is that the anticoagulant, whatever its nature, acts by inhibiting the conversion of the thromboplastin precursor to the active form.

There is thus good supporting evidence for the idea that thromboplastin exists in circulating blood as an inactive precursor that can be activated in a variety of ways. It is also likely that some of the odd pathological delays of blood-clotting may be explained by the presence of inhibitors of this activating process. But both the nature of the activation reaction and of its inhibitors have yet to be worked out, and some of CONLEY's results suggest that there may be yet further complications.

4. Hickman, K. *Lancet*, 1948, i, 652.
5. Jaques, L. B., Fidlar, E., Feldsted, E. T., Macdonald, A. G., *Canad. med. Ass. J.* 1946, **55**, 26.
6. Conley, C. L., Hartmann, R. C., Morse, W. I. H. *J. clin. Invest.* 1949, **28**, 340.
7. Quick, A. J. *Amer. J. med. Sci.* 1947, **214**, 272.
8. Brinkhous, K. M. *Proc. Soc. exp. Biol., N.Y.* 1947, **66**, 117.
9. Conley, C. L., Rathburn, H. K., Morse, W. I. H, Robinson, J. E. jun. *Bull. Johns Hopk. Hosp.* 1948, **83**, 288.

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Annotations

THE TERMS AND CONDITIONS

ON Tuesday the Ministry of Health issued the terms and conditions of service which are to be the basis of contracts for hospital and dental staff. It asks that as soon as possible hospital boards and management committees should tell the doctors concerned what duties they want them to perform as from July 5 next. Where new contracts cannot be arranged by that date, the existing interim contracts will be extended for a further specified period.

The terms and conditions have not been widely altered since the draft which we published substantially on March 19. Nevertheless there are changes in terminology that give a rather different picture of the service. The word "specialist" disappears, and the full-blown specialist is now described as a consultant. The senior hospital medical officer stands revealed as a senior member of the service, to be appointed (like the consultant) by a hospital board and not (like the registrar) by a management committee. The title of S.H.M.O. is used for convenience in defining the grade, and for purposes of official documents: but "it need not be adopted as a title describing individual officers holding the posts in this grade, and boards are free to use whatever terminology may be preferred, e.g., an anæsthetist holding a post in the S.H.M.O. grade might be given the title of 'anæsthetist,' a consultant in the same field being called a 'consultant anæsthetist'." The form of contract proposed for consultants and S.H.M.O.s is the same, and "until the service has been further developed boards may find it necessary to invite some S.H.M.O.s to undertake domiciliary consultations" for which they will receive the same fees as consultants. All this is rational, and probably in the best interest, eventually, of the service. But it will be some time before the large body of men and women who are engaged in specialist work adjust themselves to the delayed discovery that the recommendations of the Spens Committee apply only to the relatively small group now designated consultants and to juniors in training.

The term "trainee specialist" (grades 3, 2, and 1) is withdrawn in favour of "junior registrar," "registrar," and "senior registrar," and arrangements are suggested by which hospital boards shall proceed immediately with the grading of registrars.

> "Holders of registrar posts supernumerary to establishment are expected, as soon as possible, to seek posts within a hospital's normal establishment if they need further hospital posts in order to gain experience. To minimise hardship during the transitional period, however, boards of governors and hospital management committees may retain men of accepted ability holding class III posts under the scheme for postgraduate education of ex-Service officers, for a further period of six months in 'supernumerary' posts after the termination of their current appointment in cases where the latter is due to end on or before Sept. 30, 1949."

Particulars are given of the circumstances in which part-time registrar posts may be held. These will command a maximum of nine-elevenths of the whole-time salary appropriate to the person concerned.

The memorandum accompanying the Ministry's document affords many valuable explanations and some sidelights. On the subject of medical superintendents it says that "the objective of boards should be to reduce to a minimum the time given by medical staff to administrative duties, and to enable them to devote their energies to clinical work in their appropriate grade." No period of tenure is to be specified in the contract of any hospital doctor except registrars, house-officers, and certain types of clinical assistant. The Ministry emphasises that calculation of the number of notional half-days worked by part-timers must be based on the time that would be taken by an average practitioner to perform the duties, and not on the time taken by the particular practitioner. It expresses the hope that engagement of a locum will very seldom be necessary, all practitioners being expected to deputise for absent colleagues when necessary, even if this occasionally involves interchange between hospitals. Boards may allow consultants extended leave of absence (without pay) to enable them to take up teaching posts in Colonial universities, provided they undertake to return to the hospital service as soon as they come back.

> "The period of leave granted for this purpose should in no case exceed three years. At the end of such leave the board should offer the consultant a new post (not necessarily the one he held before his absence) or help him to find a post with another board."

The intention is that as far as possible the whole of the new terms of service should be applied with effect from July 5, 1948, and the boards are advised how to interpret this principle in various kinds of case. We hope that the Ministry will in this light reconsider a strange ruling in its memorandum of May 27 on appeals by practitioners for a review of their grading. This seems to say that a practitioner will be penalised financially if his successful application happens to be heard after rather than before July 5.

THE SCHOOLMEN

NOT many, perhaps, of those who attended the symposium of the Society for General Microbiology on the nature of the bacterial surface realised that they were reviving a pleasant old thirteenth century custom. Did not Doctor Perspicuus and Doctor Profundus, footsore and thirsty, converge on the Sorbonne from Oxford and Pavia and Valladolid, and there discuss the overcrowding of angels on a needle-point? It is surely not much easier to elucidate the physical properties of beings so small as bacteria as of those so remote as seraphim. Since approach in a no. 14 bus gives less opportunity for studious reflection than a stroll from one medieval university to another the organisers of this symposium had printed a series of essays by the speakers so that no undue time should be wasted in mere factual explanation. Seldom has so much wisdom been packed into 80 pages, and we trust that they will be reprinted in the *Journal of General Microbiology*. Already the bacterial surface, some 15 square microns, has been divided among the specialists and our attention was centred on those who discussed the properties of the flagellum. Is this an active organ of locomotion or a shred of capsular substance trailed behind a bacterium spinning like a corkscrew? Pijper, whose heretical advocacy of the second view has already been discussed in these columns,[1] produced one further argument: that *Salmonella typhi* moves just as well when its flagella have been removed by violent shaking.[2] Our only doubt lies in the possibility of being sure that no flagella remain after this treatment. But, true to tradition, the disputants made no converts and reached no conclusion. Prof. A. A. Miles expounded the prolegomena like a schoolman born, and we realised what had been lost when logic left the curriculum south of the Tweed. All the brightest young men know about statistical significance, but their papers suggest that they are sometimes hazy about major and minor premisses.

The form and function of a dinner fork are fairly obviously associated. Their relation in *S. typhi* is dimly visible to those who took part in this symposium. To the medical profession as a whole it would matter little if this organism were shaped like £ or swam like Captain Webb.

1. Annotation, *Lancet*, 1948, ii, 860.
2. Pijper, A. *Science*, 1949, **109**, 379.

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On the ground that they are useless organs Pijper suggests that attempts to stain bacterial flagella should be omitted from a course in bacteriology. Without necessarily accepting his argument we may support his conclusion. An overcrowded curriculum has no place for the minutiæ of botanical morphology. Bacteria infect, invade, and kill; they spread in ways known and unknown; they may often be detected and sometimes destroyed. Among the competing claims of those who know more and more about less and less the medical student might be reminded that the diagnosis and cure of diseases are still fit occupations for an educated man. But if he strays from the narrow path and wanders into a meeting of the general microbiologists he may catch curiosity, an incurable disease which other young men have caught from Pasteur and William of Ockham and Abelard. And there was another symposium years ago in Athens where they drank something stronger than the tea which we had at the Royal Institution.

PREVENTION OF GONORRHŒA

THE methods of preventing gonorrhœa after promiscuous intercourse are of particular interest to the medical branches of the Armed Forces, and their study always receives a powerful impetus from a war. Direct disinfection with antiseptics has many advocates, and considerable claims have been made for it, though it is difficult to exclude the influence of other factors, such as good discipline, temperance, athletic and other distractions, and (perhaps most important) a low incidence of venereal diseases in the civil population. The incidence of venereal diseases among troops always increases alarmingly when they are transferred to areas where the civilians are more heavily infected.

During the late war the effects of sulphonamides taken prophylactically were studied intensively in the U.S. Services, and the published results raised high hopes for this method. In 1942 Kline and Ryan [1] performed an experiment with sailors of the U.S. Navy in the Philippine Islands. They gave 2 g. of sulphathiazole by mouth the morning after exposure and repeated this dose about five hours later. After 1000 consecutive exposures for which this treatment was given only one case of gonorrhœa occurred. During the same period there were 79 gonorrhœal infections among men who did not take sulphonamides. In the same year Joses,[2] also of the U.S. Navy, tried the effect of higher dosage. He gave 3 g. of sulphathiazole at 8 o'clock in the morning after exposure, followed by another 3 g. at noon and 1 g. at 6 P.M. Among 350 men so treated there were no cases of gonorrhœa. Loveless and Denton [3] gave sulphathiazole to 1400 negro soldiers at Fort Benning while as controls 4000 others received no treatment. Before leaving the fort soldiers in the test group were given 2 g. of sulphathiazole, which they swallowed under the observation of an N.C.O. Those who reported on returning received only local antiseptic treatment; the remainder received 2 g. of sulphathiazole that night and 2 g. next morning, whether they admitted intercourse or not. The incidence of gonorrhœa fell to 8 per 1000 per annum in the test group, compared with 171 in the controls. Such treatment has obvious dangers in that it may prevent manifest infection and yet permit infection which remains latent. There is some evidence that this happens. Arthur and Dermon [4] in 1943 gave sulphonamides prophylactically to 152 men who were exposed on 199 occasions, and in each case took cultures of the prostatic fluid after some days. The incidence of manifest gonorrhœa was much reduced in the test group but the gonococcus was grown from the prostatic fluid of 5 men who had no symptoms. It is perhaps for this reason that sulphonamide prophylaxis has not been generally adopted, in spite of the excellent results reported.

It was to be expected that the effect of penicillin in prophylaxis would be studied, and Eagle et al.[5] have published preliminary results obtained with penicillin by mouth in the U.S. Navy. The 350 men of a naval unit were permitted periods of shore leave averaging six to eight hours in duration. The experimental period was thirty-two weeks, during which a control group receiving no penicillin had 43 cases of gonorrhœa following 3616 periods of leave, or 11·9 per 1000 leave periods, an incidence of 508 cases per 1000 men per year. Following 3218 periods of leave each man in the trial group on returning to the ship was given a buffered tablet containing 100,000 units of crystalline penicillin G. Gonorrhœa developed in 5 cases, giving an incidence of 1·8 per 1000 leave periods, or 105 cases per 1000 men per year. In 3 of these 5 cases there was reason to doubt whether the penicillin tablets had actually been taken. Following a further 1239 leave periods each man was given a single tablet containing 250,000 units of penicillin, and the test was made more stringent by the fact that following the last 670 of these leave periods the tablet was given only on request, so it may be assumed that all who took this precaution had had sexual intercourse. There were 2 cases of gonorrhœa, and in one the man denied that he had taken the tablet, while in the other there had been unprotected exposures subsequent to that which was followed by prophylaxis. There were no toxic effects from the penicillin, and as far as could be ascertained there was no instance of suppression of syphilitic infection. How long such dosage of penicillin might be expected to give protection is unknown.

This experimental work with penicillin remains to be confirmed and extended. So far the results have been very similar to those with sulphonamides. The points which remain to be determined are whether in such cases there can be suppression of gonococcal infection without cure; and whether there is any significant danger of prolonging the incubation period of syphilis or suppressing the early signs of syphilis without curing the disease.

STEEL MANUFACTURE AND FLUORINE HAZARDS

IN the United States, where the use of sodium fluoride as a flux in various industrial processes has mushroomed from pounds per day in 1942 to tons per day now, suspicion of potential fluorine hazards has provoked much labour unrest. The Public Health Service accordingly undertook a survey of the health of workers exposed to sodium fluoride at open-hearth furnaces in four Ohio steel plants.[6] They concluded that fumes, smoke, and dust encountered at the open hearths induce an upper respiratory symptom-complex which may be irritating and annoying; but in their investigations they found difficulty in separating the effects of fluoride, tar smoke, and sulphur dioxide. This inquiry, carried out in January and February, 1948, did not include neighbourhood hazards, but in October, 1948, the Pennsylvanian fog disaster in the steel-making town of Donora drew public attention to the risks of fluorosis in the neighbourhood of steel work.[7] In Britain information has been published about human fluorosis hazards associated with the use of fluorspar in the manufacture of fluorine compounds,[8] the open calcining of iron ore containing fluorine,[9] and the addition of cryolite in the manufacture of aluminium.[10] Outbreaks of animal fluorosis have also been related to the use of

1. Kline, E. F., Ryan, T. C. *Nav. med. Bull., Wash.* 1942, **40**, 360.
2. Joses, M. *Ibid*, p. 113.
3. Loveless, J. A., Denton, W. *J. Amer. med. Ass.* 1943, **121**, 827.
4. Arthur, R. D., Dermon, H. *Amer. J. Syph. Gon. ven. Dis.* 1943, **27**, 261.
5. Eagle, H., Gude, A. V., Beckmann, G. E., Mast, G., Sapero, J. J., Shindledecker, J. B. *Publ. Hlth Rep., Wash.* 1948, **63**, 1411.
6. Public Health Bulletin, no. 299. Federal Security Agency, Washington, 1948.
7. *Lancet*, 1948, ii, 738.
8. Wilkie, J. *Brit. J. Radiol.* 1940, **13**, 213.
9. Murray, M. M., Wilson, D. C. *Lancet*, 1946, ii, 821.
10. Medical Research Council Memorandum no. 22. London, 1949.

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a marine clay containing fluorine in brick-making and to the emission of fluorine compounds in glazing processes.[11] In view of the national importance of steel and of the centralisation of large works in association with schemes for the modernisation of steel manufacture,[12] the fluorine hazards inherent in the steel industry seem to deserve consideration.

CHILDREN'S RECEPTION CENTRE

IN his well-known proposals for the organisation of the mental-health services,[13] Dr. C. P. Blacker recommended that, for the many children who need a new home, reception centres should be provided—one to every area containing a million people. Here the children might remain for two to four weeks, during which time enough information would be gathered about each child's home and social background, his personality and needs, to enable a balanced judgment about his disposal and after-care to be offered to the responsible agency. Some of the children would be mentally healthy; others would be intellectually and educationally subnormal, delinquent, neurotic, or otherwise mentally unstable; but all would profit by this informed unhurried assessment of what would be the best way of arranging the next step—a step which might affect the whole course of their lives.

In October, 1947, through the generosity of the Nuffield Foundation, a reception centre on these lines was set up with an advisory committee of which Dr. Blacker was chairman. The interim report of this experimental reception centre at Mersham in Kent has now been issued, and contains an account of the procedure and day-to-day working which will be of great assistance to those who have to develop similar centres, though not all can count on beginning under equally favourable auspices. The centre was closely associated with the Caldecott Community, whose head, Miss Leila Rendel, had exceptional qualifications for taking on the direction of the new venture; the authorities of Kent, whose area it served, offered their coöperation; and a staff which included a strong psychiatric team was available from the outset. Their practical outlook and experience are evident in the account that is given of the case-conferences at which each child's problems and disposal are reviewed in full: the recommendations made at these conferences, which are passed to the county authorities and juvenile court who had referred the child, are made "under two headings: (1) what arrangements are desirable and best suited to the child's needs, (2) what arrangements would be practicable and fairly satisfactory if the former cannot be made, owing to the present dearth of vacancies in suitable schools, hostels, &c?"

The report makes it clear that there is still room for much improvement in the provision for getting all the children who need it admitted to the reception centre, and, still more, in the facilities which the community offers for placing such children in the foster-homes, schools, hostels, and small residential centres which their varied interests may require. This has entailed delays or faute-de-mieux arrangements, which will, however, no doubt be less in evidence when the full advantages of the Children Act are enjoyed. There are also some restrained comments in the report on the way a child, after leaving the centre, may come in contact with several welfare and boarding-out officers, instead of having the steady contact with one trusted and friendly adult which will help to give him a sense of security. This need for a close personal relationship on which the child can rely is stressed in many passages in the interim report, and is implicit in the references it makes to the human element—"a convenient phrase to describe the play of personality, the regard for the individual and, in particular, the concern for the child's feelings without which the best organisation and paper recommendations are of little effect."

An informative series of tables indicates the provenance of the 145 children admitted during the first nine months, the main reason for their admission, their level of intelligence, and the frequency of environmental and psychological factors that might have contributed to their dislocation. The most significant of these tables are those showing that many children whose behaviour is normal have been exposed to some of the adverse influences usually held responsible for severe disturbances of behaviour; and the disposal table makes it evident that in only about half the cases had the recommendations made at the centre been promptly put into effect by the disposing authority. These departures, in the matter of disposal, from the ideal course of events will have to be taken fully into account when, in follow-up studies which are doubtless planned, the value of the reception-centre procedure is studied in detail: they also underline the statement in the report that "the success of a reception centre depends inevitably on the extent and variety of the community's resources which can be drawn on, just as in a larger sense the future of every child admitted to the centre is determined in part by the mores and stability of the society in which he must live."

The reception centre at Mersham will no doubt be a model which many local authorities will follow in setting up their own institutions of the kind. It is to be hoped that these will be organised, not only with the same thoroughness and humane outlook but also with the closest regard to local conditions, so that ingenious and careful plans shall not be frustrated through lack of integration with the social services and health services of the area.

SHORTAGE OF BEDS

THE Local Medical Committee for the County of London have issued to the press a resolution stating their alarm at the prospect of difficulty next winter in providing enough beds for the acute sick. They call for the appointment of a medical admissions officer in each management-committee group, with power to decide which patients need admission and power to demand admission for any such patient. At first sight this would not differ much from the present system whereby management committees appoint medical referees to whom appeals for help can be made by the regional-board medical officers attached to the Emergency Bed Service. The new proposals, however, reverse existing procedure and would put on these medical referees the responsibility for dealing with all applications. As we understand that no fewer than 45,000 applications reached the Emergency Bed Service in the first ten months of the National Health Service, a very considerable new task would be imposed on men who already carry senior hospital appointments, and who have hitherto been called on relatively seldom—when the normal channels have failed. Possibly other men could be found to undertake the work. The real problem, however, is the shortage of staffed beds; for no admissions officer, however powerful, can admit patients to beds which are not there. He could perhaps insist on overcrowding of the wards; but the regional boards have set themselves against overworking their nurses, in the hope that this will lead more women to take up or return to nursing. This policy is now beginning to bear fruit, and holds the surest hope of relief in the long run. To abandon it next winter would be a retrograde step.

11. Blakemore, F., Bosworth, T. J., Green, H. H. *J. comp. Path. Therapeut.* 1948, **58**, 287.
12. *Times*, June 1, 1949.
13. Neurosis and the Mental Health Services. London, 1946.

Lieut.-General Sir Alexander Hood, formerly director-general of Army Medical Services, has been appointed governor and commander-in-chief of Bermuda.

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Special Articles

THE CHRONIC SICK UNDER NEW MANAGEMENT

EXPERIENCES IN STARTING A GERIATRIC UNIT

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THIS paper describes observations at a hospital for the chronic sick during the first few months after it was taken over by a London teaching hospital. A geriatric unit has been formed, under the care of a consultant, with facilities for investigation, treatment, and research; and this is, we understand, the first unit of its kind in this country to be established as part of a teaching hospital. Our experiences in the transition period are described in the hope that they may be of help to others carrying out similar work.

BEFORE THE CHANGE

The hospital, which was under the administration of the London County Council, had three 36-bed wards for men and three 45-bed wards for women, the latter being full to capacity. Most of the patients were 65–85 years of age, but some were under 50 and one was 29. The bed strength of the geriatric unit will eventually be 120.

The diagnoses on the case-sheets were often in such vague terms as "senility" and "myocardial degeneration"; "hypertension" was frequently used for want of a better label.

The patients were well nourished, clean, and without bedsores; but almost all had painful, stiff, and in some cases fixed, joints in their lower limbs, which were usually held in that position found most comfortable. It is these stiff and painful joints—resulting from long-continued immobilisation in tightly made beds—that form the greatest problem in getting these patients walking again.

The mental state tended to be one of apathy and depression. Many seemed to have sunk into "mere oblivion," from which they stirred only at meal-times. They knew that they were in a hospital for patients considered to need hospital care for the rest of their lives, and many were also depressed because they had been shunted about the countryside in the previous few years, owing to evacuation during the air-raids. There were a few with definite dementia, and several with chronic delusional states (usually paranoid), especially among the deaf (cf. Affleck 1947); but one has a feeling sometimes, when an old lady of 84 announces that she is feeling off-colour because she is going to have triplets, that this is a manifestation of Cockney wit rather than psychosis.

There seemed to be so little to occupy the minds of the patients that these too had become almost functionless through lack of use. Some of the changes found were due perhaps to chronic cerebral ischæmia (Howell 1944), but the recovery in most of them as time went on shows that this was not the usual reason for the apathy.

On the female side there was formerly one nurse to 4·5 patients, and there is now one nurse to 2·7. On the male side the nursing is virtually unchanged, being still done by the male assistant nurses previously employed by the L.C.C. On the female side nurses from the main hospital come for three months as part of their training. Thus we have been more fortunate than others doing this type of work in having ample numbers of nurses who are enthusiastic and who are not with these patients long enough to find their duties monotonous.

The wards all suffered from lack of any recent redecoration and were uniformly painted in a drab "institutional" green. In each ward there were too many beds, and they were crowded together back to back.

Previously any X-ray investigations required were made by visiting radiographers from other L.C.C. hospitals in the area, and pathological specimens were sent to the district laboratory; in one case a urine specimen had been sent several miles away for it to be pronounced free of sugar and albumin. One almoner visited for half a day once a week, and a physiotherapist visited for three hours daily.

Since the change-over the aim has been to make investigation and treatment more self-contained, and the services mentioned above are now performed by a staff permanently attached to the hospital; in addition there is an occupational therapist and a dietitian. Shopping for the patients, previously done rather haphazardly by the ward orderlies, is now done weekly by a voluntary helper. Contact with the outside world has been made by some of the patients, who are taken by the nurses to the cinema and restaurants and some to the homes of their relatives. One ambulant hemiplegic manages to visit "the local" almost nightly—so far without mishap.

PATIENTS' REACTION TO THE CHANGES

Undoubtedly, the initial reaction of the patients was mainly one of misgiving. Most of them were thoroughly despondent; perhaps they remembered previous experiences during evacuation; and they assumed that they would have no choice about their future disposal. Their pessimism seemed to arise largely from a dislike of any change, however trivial, and from the fact that many seemed to have resigned themselves long ago to staying in the "chronic wards" of the same hospital permanently. It was this tacit assumption of a hopeless prognosis by patients, relatives, and staff that most impressed the newcomer. Relatives would say that before a patient's transfer from another hospital to the present one, they had been told that he would be there for the rest of his days, and they had sometimes acted on this assumption by giving up his home. There were, of course, a number of other factors leading to the patients' anxieties and apprehension. Of these an uncertainty about their pensions was prominent; for the pocket-money they received regularly from the L.C.C. out of their old-age pensions had been their one source of independence. Any alteration in this respect was due more to the passing of the National Insurance and National Assistance Acts than to the change in hospital administration.

MEDICAL MANAGEMENT

At the outset every patient had a full medical examination, and the diagnosis was reviewed. In some cases it was hard to distinguish the effects of long immobilisation in bed from those of the original disease. For example, it was thought at first that the pain in the paralysed limbs in some cases of long-standing hemiplegia might have a central origin, but we later realised that it was usually due to the stretching of muscle contractures, and joint adhesions. Nascher (1919) points out how often the manifestations of old age simulate the symptoms of a disease, and how important it is to distinguish these manifestations so that one avoids treating a normal condition of old age in mistake for a pathological condition. In a high proportion of cases the mode of onset and the nature of the original symptoms had long been forgotten by the patient; the diagnosis then, as in pædiatrics, had to be made largely on the results of objective examination. Little help was obtained from the case-records which hardly ever described a detailed

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medical examination, and usually repeated, over a period of many years, the phrase "no change"—conveying, if anything, a remarkable arrest of the normal process of ageing.

With a view to their management in the immediate future, the patients were then classified as follows:

1. Those whose recovery, with treatment, was anticipated.
2. Those, largely of the infirm class, who required no medical treatment but a certain amount of general attention. These, for the most part, could be discharged home or accommodated in residential homes for the aged.
3. Those considered likely to be irremediable, who need much nursing attention and would ideally be accommodated in long-stay annexes (British Medical Association, 1947).

THERAPY AND REHABILITATION

In patients of the first class, whose recovery is expected, intensive therapy is being undertaken. This of course varies, but some of its more interesting aspects may be mentioned.

Medical Treatment

Chest Conditions.—Many of the patients who formerly would have succumbed to bronchopneumonia can now be treated successfully with penicillin. This, however, leads to new therapeutic problems in the way of an increased number of helpless patients: the man who fractures his femur, or who has a stroke, and later gets bronchopneumonia, often now survives the latter and so requires treatment for the original catastrophe.

After misdiagnoses had been excluded, chronic bronchitis was found to be comparatively rare. The cause of the symptoms was often left ventricular failure (see Lister 1949).

Cardiovascular System.—Left ventricular failure, due to coronary heart disease, with or without hypertension, was common compared with right ventricular failure. The rarity of the latter may be correlated with the infrequency of valvular heart disease in our series, due (1) to its earlier age-incidence and poor prognosis, and perhaps (2) to the reluctance of teaching hospitals to allow their cases of valvular heart disease to leave the surveillance of their cardiac clinics, where they can receive the necessary continuous medical attention and provide useful clincial and teaching material. In the treatment of left ventricular failure a good response is often seen with digitalis (Fishberg 1940), but in general the results are better with mercurial diuretics (especially in cases with normal rhythm). A weekly, or twice-weekly, injection of mersalyl usually prevents previously frequent attacks of cardiac asthma.

Auricular fibrillation, from coronary disease, was found to be common, requiring treatment with digitalis; the need for continuous medication was recognised (Lovibond 1949). The possibility of using long-term anticoagulant therapy in such conditions as auricular fibrillation and coronary thrombosis has not yet been explored, but it is in this kind of patient, who can be observed in hospital over long periods, that this form of therapy might be most worthy of trial.

In bedridden people the effects of arteriosclerosis, and of gradual diminution in the blood-supply to the limbs, become manifest comparatively late. Owing to inactivity, intermittent claudication as an early warning sign is absent, and the presenting symptoms usually take the form of nutritional disturbances of the skin and actual gangrene. Major operative procedures, such as sympathectomy and amputation, are precluded in most cases by the patient's frailty, and are not likely to add to his comfort. In one case spreading gangrene of the feet was observed, having been preceded for several years by trophic changes in the skin of the toes, and infection in the final stages was controlled by large doses of penicillin. A virtual mummification of the feet and legs took place, without the development of septicæmia or marked general toxic effects.

Central Nervous System.—The majority of cases in this group were those of hemiplegia, showing wide variation in severity and also in the final position of the limbs. There seems to have been a general assumption that little could be done for these patients, but with a programme of graded exercises some who had been bedridden as long as four or five years have now become ambulant. Early active treatment, begun soon after the stroke, will prevent much of what may become the major part of the disability—namely, the pain and stiffness resulting from joint changes.

Alimentary System.—Very few patients have shown evidence of alimentary disease.

Incontinence, previously a common symptom, has largely disappeared, with the awakening of the patient from mental apathy and with the prompter provision of bedpans made possible by having more nurses.

Surgical Treatment

There is little scope for surgery. We have had the advice of a consultant orthopædic surgeon in the provision of appliances to assist patients to walk; but none has been found suitable for operation.

The provision of dentures, spectacles, and hearing-aids for old people has been admirably discussed by Sheldon (1948). A number of our patients have been supplied with 'Medresco' hearing-aids, which undoubtedly assist them in hearing, but the patients require much encouragement to use them. The medresco aid has for us one serious disadvantage—namely, the difficulty the aged have in turning it on and off. The small milled wheel which acts as a combined on-off switch and volume control is difficult, and sometimes impossible, for their fingers to manipulate.

Physiotherapy

Physiotherapy is needed at every stage of rehabilitation. Exercises, carefully explained and performed, either individually or in a class, are paramount, and there seems little place for the more time-consuming and expensive methods of physical treatment, such as short-wave diathermy, ultraviolet light, and faradism.

Occupational Therapy

A carefully chosen programme of occupation can renew interest in life, allay mental deterioration, disguise progressive failure of mental and physical powers to the patient, and help to treat specific conditions in which there is muscle incoördination or risk of losing mobility of joints. This applies particularly to those who must obviously remain bedridden for the rest of their days.

Patients are often hesitant in starting this form of treatment, and occupations showing quick results for little labour are most suitable at first. To maintain interest, the patient must not only feel a sense of achievement in being able to make things, but must know that what he makes is being put to some use.

PROBLEMS OF DISPOSAL

While rehabilitation was proceeding, the patient's social history was investigated by the almoner, with a view to re-establishing lost contacts with relatives and examining the possibility of a return to his home, if and when he becomes fit enough. It was encouraging to find that some 30% of bedridden patients had become ambulant after a few months. With the improvement in the patients' physical state, their apathetic attitude and the atmosphere of apprehension began to disappear. It is interesting, however, that their reactions to efforts to make them more mobile were mixed (this is also reported by Thomson 1949); some were delighted at becoming more independent, but others were diffident,

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and felt perhaps that this was the first step towards their discharge from their sheltered hospital existence. At first the attitude of the relatives was on the whole discouraging, and might be summarised by the remark of one of them, "If he gets up, he'll want to come home." In most cases the patients had been away from home so long that their relatives had become accustomed to living without them, or, because of the war, no longer had accommodation. Many patients seem to be stranded in hospital because their homes were broken up by the war; they were evacuated and contact with their families was lost.

The main obstacle to the rehabilitation of many patients remains the shortage of accommodation in the homes for the elderly. The occupation of beds by recovered patients, who could be in their own homes if domestic help were available, has been reviewed by Amulree and Sturdee (1946). Until old people can look forward to settling in congenial surroundings after their discharge from hospital, it will be difficult to arouse their desire to live a more independent life. They are naturally disinclined to leave surroundings which have become familiar to them, and the staff and other patients they have come to know so well.

Where new patients are admitted, it is our policy, following that of Dr. Marjory Warren, to interview the relatives personally, and unobtrusively indicate that the stay in hospital is not likely to be permanent. This prevents the disintegration of the family circle, which has occurred so much in the past, and ensures that, wherever possible, provision is made for the return of the patient to his own home.

THE INTEREST OF GERIATRICS

The present high proportion of the aged sick and of old people in the population is unprecedented. Yet it is only recently, since institutions containing the "chronic sick" have been taken over by general hospitals, that the magnitude of the problem has forced itself on the attention of the medical profession as a whole. There is no doubt that throughout the country patients of this type have been inadequately cared for in the past. During the war the lack of attention devoted to this field was perhaps understandable, for the limited numbers of hospital beds were more urgently required for the acute sick. It is apparent, however, how much can be done for the rehabilitation even of the previously styled "bedridden" case and how much more successfully the problem of the aged sick could be tackled by their earlier treatment, before the effects of prolonged immobilisation develop.

The field of research in diseases of old people is vast and largely unexplored. Little is known even of what is expected as normal values for the many quantitative tests that can now be applied to the body fluids and the functions of its various organs. For instance, Rafsky et al. (1949) have shown that in the aged there is a rise in the β-globulin, with a low serum-albumin; Hamburger (1948) has found a persistent falling-off of the daily excretion of 17-ketosteroids in both sexes after the menopause; while Pedersen-Bjergaard and Tonnesen (1948) have shown that the pituitary gonadotrophic excretion becomes maximal about the age of 70. Once the normals have been established, the way will be clear for investigating how the changes from the values of younger subjects come about, and thus some light might be thrown on the fundamental problems of the process of ageing.

From the nursing point of view, it might be thought that geriatric work is dull. This we believe not to be so. The care and devotion the nurses have shown to these patients is almost beyond praise. Looking after these people, who often are helpless and entirely dependent on others, carries with it a sense of inner reward and æsthetic satisfaction probably not to be found in any other branch of nursing.

In the training of medical students a few months spent in the geriatric wards, taking rather more than a mere passive interest, will be as valuable as similar time spent in the general wards. The future general practitioner will thus become better able to cope with the problems of his aged patients, who will form a high proportion of his practice. Moreover, the clinical material found is often more instructive, as regards the Art of Medicine, than that seen in the acute wards. The student will have an opportunity of studying certain maladies which in the main hospital he would very seldom see—e.g., the late stages of disseminated sclerosis, Friedreich's ataxy, athetosis, gout, and Paget's disease.

Also the medical student can play a big part in the rehabilitation of the untreated chronic cases; thus he can supervise bed exercises, and the setting up and adjustment of suspension frames; and in this way relieve the burden on the physiotherapists. Moreover, the student, with more time at his disposal than the houseman, has ample opportunity for getting to know individual patients, and so for assisting and encouraging them on their often rather long road to recovery.

Dr. John Smith, as long ago as 1666 pointed out the path physicians should follow in this type of work:

"Let None give over their patients, when they come to be burdened with the infirmities of Age, as though they were altogether uncapable of having any good done unto them; for, as this will argue great weakness and ignorance in the Physician, so it is exceeding cruelty to the patient; for, as the slothful in his work is brother to a great waster, so those that are negligent to their Ancient Friends, are very near of kin to those inhumane Barbarians, who with great pomp and alacrity both kill and devour them, thinking thereby they perform a most charitable office in delivering them from those incurable maladies, which will for ever render them miserable."

King Solomon's Portraiture of Old Age.

We wish to acknowledge our great appreciation of the enthusiastic guidance with which Lord Amulree has encouraged both our work in the wards and the preparation of this paper. We are further greatly indebted to Miss B. L. Robertson, the almoner, and Miss C. G. Miles, the occupational therapist, for many suggestions.

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L'AFFAIRE LYSENKO

FROM A CORRESPONDENT

"An intense struggle is raging in the field of biology today between the progressive and the reactionary, between the old and the new, between materialism and idealism. In this struggle the progressive scientific ideology of the Soviet Union stands opposed to the putrid ideology of the capitalist world. The struggle that is going on in the field of biology is a reflection of the acute intense class struggle."
—POLYAKOV.

THE English translation [1] of the verbatim report of the proceedings of the Lenin Academy of Agricultural Sciences of the U.S.S.R. in the session which lasted from

1. The Situation in Biological Science. Moscow, 1949. Distributed in Great Britain by Collet's Foreign Department, 67, Great Russell Street, London, W.C.1. Pp. 631. 9s. 6d.

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July 31 to Aug. 7, 1948, reveals three main factors contributing to this dispute. The need to re-establish Russian agriculture after the damage done by the war led to experiments on an enormous scale, in which Russian breeders of animals and plants have apparently achieved great successes. Having produced new and useful varieties, they feel that they know far more about variation and its causes than do the geneticists, whom they accuse of spinning theories without practical achievement. The second factor is xenophobia, directed particularly towards the U.S.A., where much of the more recent work on genetics has been done by the Morganists. The third factor is the belief that an immortal germplasm savours of religion.[2] These three independent factors converge on genetics as on a target, and they are aided by the fact that communism denies the importance of pedigree or race, placing all men on a common level. Denial of the existence of genes [3] logically leads to the view that variation is due to external influences acting on the somatic cells, and that the scion affects the heredity of the stock on which it is grafted. The quarrel is thus between academic research into genetics and practical agricultural research, combined with the difference of opinion about the mechanism of heredity, the Michurinists supporting the theory of the inheritance of acquired characters.

According to the Michurinists, as Lysenko and his colleagues call themselves, changes in heredity are the result of changes in the soma due to altered metabolism; hence changes in heredity, the acquisition of new characters, and their transmission are always due to environment. Lysenko [4] defined heredity as

"the effect of the concentration of the action of environmental conditions assimilated by the organism in a series of preceding generations. . . . Heredity is a property not only of the chromosomes but also of every living thing, every cell and every particle of the body. For heredity is determined by the specific type of metabolism. You need but change the type of the metabolism in the living body to bring about a change in heredity."

Speaker after speaker described new useful varieties of animals and plants and claimed that the variation had been directed by man. Isayev quoted the proud words of Michurin engraved on his monument: "Man can and must create new breeds of plants better than Nature." The main argument against genetics, however, was political. Thus Eichfeld spoke of the geneticists as having no direct connexion with production:

"This puts them in a privileged position; they are working for themselves as 'private gentlemen.' . . . Further, they have at their disposal the overwhelming majority of the chairs in the biological faculties. . . . All the more regrettable is it that nowadays so many of our biologists laud and extol not progressive scientists, our fellow-countrymen, but representatives of reactionary idealistic trends in science abroad."

Shaumyan said:

"The theory of genes is reactionary to the core, for it is bound to lower the rôle of Soviet man; this theory wants to make us bend the knee to nature; it tries to convert Soviet man into a passive appendage of nature, a placid contemplator of nature who humbly waits for gifts and favours from her. The principles underlying the Michurin-Lysenko theory are precisely the opposite. This theory raises man to a position of eminence he never attained before, makes him the real master and commander of nature, and indicates Soviet man's place and part in the bold resolute refashioning of nature."

Chekmenev claimed:

"Our science is the most advanced, most progressive science in the world. This is because it is based on dialectical materialism, on the scientific revolutionary theory of Marx-Engels-Lenin-Stalin. The aim of the fruitful activity of our scientists is to serve the people, our Soviet State. Therein lies the enormous advantage possessed by our science over that of any capitalist State, where it serves the mercenary interests of private profiteers, and is the means of enriching the exploiting classes and oppressing the working people. . . . There is no such thing as non-partisan science. . . . Michurin biology is a science based on Party principles and cannot permit of a conciliatory attitude to reactionary biology."

On the third day of the session Rapoport spoke for genetics and pointed out that contending theories were useful for discovering the truth: "any restriction of opportunity or excessive severity towards theory would have been prejudicial to the interests of science." He enumerated practical achievements based on the theory of genes, and argued that Lysenko was inconsistent, because selection was incompatible with Larmarckism. Michurin had used selection in all his works and had repeatedly urged young scientists to study genetics; Lenin had taught them that it was their duty to assimilate all that had been done abroad.

On the fifth day of the session Zavadovsky said that he was at variance with Lysenko on a number of points, but was "an ardent adherent of the Michurin trend." Alikhanian, the third speaker against Lysenko, pointed out that, if a scientist made reactionary statements, it did not follow that any scientific fact discovered by him should be discredited. The gene had objective reality; it was a material unit in a living cell:

"The attacks on the view that genes exist remind me of the earlier denials of the existence of the atom. Though the atom itself has never been seen, no-one doubts its existence today. So it is with the chromosome. There were scientists who vigorously denied the reality of the chromosomes."

He quoted Lysenko's writings in 1947 admitting the chromosome's part in the transmission of heredity, and asked him:

"If, as you most properly put it, changes in the chromosome produce changes in character, why then not investigate the mechanism and the nature of the changes produced in the chromosome so as to be able to control them? Why should the statement of Lysenko that 'the various morphological characters of a chromosome often, and even always, bring about changes in character' be considered correct, while the conception of the heterogeneity of the chromosome, the qualitative dissimilarity of its various parts, and of the significance of the chromosome numbers in the development of character (polyploidy) be denounced as downright idealism by Mitin?"

To counterbalance the evidence of useful agricultural variations produced by the Michurinists, Alikhanian described what the geneticists had done in the same way.

Polyakov denied that Lysenko could cause what variations he wished; Lysenko could only alter the environment to enable organisms to flourish exceedingly, and then select from the resultant variations.

Zhukovsky also supported genetics, basing his argument on the alternation of generations in plants and on the reduction of chromosomes in animals, which could be watched by microscopy. Kostryukova,[3] he said, had denied the existence of the gene because no-one had seen one; but the existence of viruses was denied for a long time, and now we could see them. Viruses propagated without being alive and caused unusual phenomena in the host's cells. Catalysers also produced complex biological phenomena. Therefore why could not the gene? Zhukovsky challenged Lysenko to issue a comprehensive manual on how to train plants to vary in accordance with agricultural requirements.

On the eighth and last day of the session Lysenko revealed that the Central Committee of the Communist Party had approved his opening speech. The session came to an end with recantations from Zhukovsky, Alikhanian, and Polyakov. But in his original speech Alikhanian had said: "One thing is clear: facts cannot

2. "A mystical, mythical, and actually non-material gene" (Perov); "Genetics drags us towards mysticism, it is the straight road to clericalism" (Demidov); "Nobody will be led astray by the Morganists' false analogies between the invisible atom and the invisible gene. Far closer would be the analogy between the invisible gene and the invisible spirit" (Prezent).
3. "The gene is an utter fiction, however much you, Comrade Rapoport, may assert that it is a particle of matter. The electron microscope will not save you. You may see under an electron microscope whatever minute particles you like, but they will still be nothing but particles of a chromosome, and you will never see a gene, for there is no such thing, no more than there is a vital force" (Kostryukova).
4. Lysenko's opening speech has been reviewed by R. B. Goldschmidt (*Science*, 1949, **109**, 219).

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be disregarded." And Rapoport had said: "Truth emerges from conflict."

Let us hope that it does. Meanwhile, if we feel any doubts about genes we can study the photographs illustrating Darlington's recent article on genetic particles.[5]

REMUNERATION OF MEDICAL LABORATORY TECHNICIANS

ON April 20 the appropriate technical council of the Whitley Councils for the Health Services agreed to the following salaries for medical laboratory technicians employed in the National Health Service in England, Wales, and Scotland.

Student and junior technicians.—From £110 at 16 years of age to £299 at 25 years and over. On passing the intermediate examination of the Institute of Medical Laboratory Technology (or equivalent qualification) or the Inter. B.SC., salary to be increased by £13 per annum at any point on the scale. If no examinations passed, salary to be increased to £312 at age 30.

Technicians (who must hold associateship of I.M.L.T. or equivalent).—£370–£15–£435. On gaining F.I.M.L.T. (or equivalent) salary to be increased by £15 at any point on the scale.

Senior technician (who must hold F.I.M.L.T. or equivalent and be in charge of a laboratory or a separate department).—£450–£20–£530.

Chief technician (who must be in full charge of laboratory services, or a specialised laboratory of unusual size and importance or a central reference or research laboratory).—£530–£20–£650.

In the Metropolitan Police Area all scales will be subject to London weighting on the following basis: 16–20, £10; 21–25, £20; 26 and over, £30.

5. Darlington, C. D. *Endeavour*, 1949, 8, 51.

Reconstruction

SOCIAL MEDICINE IN THE UNIVERSITIES

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Two conferences on social medicine were arranged at Oxford during April by the Nuffield Foundation, at the request of the medical subcommittee of the University Grants Committee, which "has had under consideration recently the provision made in medical schools for teaching and research in social medicine." No doubt it was the hope of its organisers, as well as of those attending, that the conferences would provide a statement of past achievement, or of plausible intention for the future, which would satisfy a critical observer that the provisions already made in the universities are justified and merit favourable consideration of their extension. Moreover, the answer which the request of the University Grants Committee invited will later have to be given to many other people who take the present claims for social medicine on trust and reserve judgment on its future.

Though no direct answer emerged at Oxford, the conferences at least disposed of the confusion between two common grounds for criticism which in part explains the ambiguity of much of recent comment on this subject. It is necessary to remind ourselves that, for many years before the first chair of social medicine was established, far-sighted people had hoped to see an increased emphasis on social and preventive teaching in medicine. They had anticipated that a few clinical teachers would interest themselves, and that their interest would spread to their colleagues. To a limited extent this has happened, and American clinicians, such as Means in medicine at Harvard, and Harvey in surgery at Yale, are examples of such initiative which have their parallel in this country. We should recognise that this work proceeded in the orbit of clinical medicine, without assistance from departments of preventive or social medicine.

The creation of whole-time departments of social medicine in several universities entirely changed the position. Naturally these departments inherited responsibility for public-health teaching, to which inevitably was added a special rôle in relation to the changed attitude to clinical teaching. But what we are now called on to consider is not only whether clinicians can reasonably be asked to extend the range of their interest but also the grounds upon which an appeal can be made to the universities for support for full-time departments. A satisfactory answer for the one will not do for the other, and we may put these issues in perspective by considering more carefully the two lines of criticism to which they give rise.

TWO CRITICISMS

The first is the criticism of the practising clinician, who considers that, however worthy the intentions of his colleagues, their preoccupation with the social background of illness is mistaken. He does not question that sometimes the social environment is related to the origin, development, or spread of illness, or that social complications may result from illness; nor does he question that these matters are so important that someone must make it his business to deal with them. What he does question is the suggestion that it is his business, or that of a sufficient proportion of his students to justify its inclusion in his teaching.

It is important to distinguish this criticism from the one which follows. The clinician who hesitates to raise the sights of his teaching is rarely passing a judgment on the claims of social medicine as an academic department. He is usually quick to admit that he does not know what these claims are, and modestly reserves judgment on them.

The second criticism is that of the full-time university teacher. The laboratory and the clinical research workers agree that no academic department fulfills its obligations unless it contributes to research as well as to teaching. In their opinion, a subject which justifies the creation of chairs in many universities must demonstrate a field of inquiry with promise of a contribution to medical knowledge which will not suffer by comparison with physiology or medicine. It is in this light that they examine the claims of social medicine, and unlike the clinical teacher pass no judgment on its teaching.

The first of these criticisms is entirely reasonable and fully merits a considered reply. But from the point of view of the full-time department it is the less serious of the two, and since it need not disturb the academic status of social medicine it will not be discussed here. To put the claim at its lowest, no-one questions that the traditional public-health course still has a place in teaching, though to many people its solid if undramatic achievement must recently appear to have taken on a great deal of water. Even if unchanged this course could reasonably be considered the teaching complement of a development justified by its fruitful research.

The second criticism is more serious and requires an immediate answer. It is difficult at this time for new departments, of which the oldest has been active for only a few years, to show the published results which would be the best vindication of their claims. None the less, it is entirely reasonable to expect them to provide

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an intelligible statement of what they consider their terms of reference, and in brief such a statement follows :

(1) The department of social medicine accepts responsibility for the continuation of the preventive tradition in teaching, effectively established in a limited field by the earlier departments of public health, and for the initiative in its extension to clinical teaching.

(2) Important as this is, it is by no means sufficient justification for the creation of full-time university departments. If this were all, the existing part-time arrangements in public health, with the added interest of far-sighted clinicians in social and preventive teaching, would offer a solution which would easily compensate in economy for any loss in effectiveness.

(3) The department of social medicine recognises that its claim to academic status requires a satisfactory answer to the question : Can it establish a field of medical research inadequately catered for and of sufficient importance to justify a new academic development ?

(4) This field of research may be indicated as follows : (*a*) A vast number of medical problems, both curative and preventive, can be investigated only by large-scale inquiry. (*b*) The problems of collecting observations on large numbers of people have so little in common with experiments on large numbers of laboratory animals, or with observations on small numbers of patients, that a university department may profitably occupy itself with them.

CATECHISM

Some pertinent questions may be raised and answered as follows :

Question.—What reasons are there for thinking that social medicine so defined can add conspicuously to medical knowledge ?

Answer.—Until now medicine has relied for its advance mainly on two sources : the laboratory, and the bedside. Research on man adds to the problems of variation which are common to the whole of biology the further difficulty that its material is not available for controlled experiment ; it therefore depends especially on research on large numbers. Of its two present sources, the experiments of the laboratory are often conclusive but not entirely relevant, and the observations at the bedside are quite relevant but rarely conclusive.

Q.—Is not this simply the application of statistics to medicine, and will not a well-trained professor of medicine (for example) expect to use statistical methods in his investigations ?

A.—Certainly. He also uses physiological methods, but there is still a place for a department of physiology concerned with the development of methods and with their application to problems beyond the resource, time, or interest of the clinician.

Q.—Are such problems as tuberculosis, prematurity, incentives, and the human factor (all commonly discussed in relation to social medicine) those with which social medicine is mainly concerned ?

A.—It will be evident that, as defined, social medicine is by no means limited to such issues, though they are among the more challenging with which its methods promise advance ; but it would be premature, to say the least, to suggest that answers are readily available for all these riddles, which have in common their great difficulty as well as their great importance. At present we are not even clear about the kind of evidence needed for the solution of such problems, and a clarification of this would be a first considerable contribution. For this reason research in a new field is necessarily difficult, since it involves not only the collection of reliable data but also the definition of standards by which their validity may be judged.

Q.—Is not the public-health department a better place than the university for the direction and execution of large-scale inquiry ?

A.—The public-health department has at its disposal some of the important sources of raw data, and there is every reason to encourage its staff to take an interest in field inquiry ; but it is certainly not the only source (the hospital, general practice, and industry are others), and the technical issues arising in the design and execution of these investigations will require more attention and training than the public-health officer can bring to them.

Q.—Is the work of the epidemiologist on the infectious diseases an example of social medical research ?

A.—It is an excellent example, and the department of social medicine which does effective work on this subject calls for comment rather than criticism. The case for social medicine in the universities now rests on the assumption that similar inquiries may be extended fruitfully to other fields ; this view can scarcely be supported by further demonstrations of their effectiveness in epidemiology, which no-one questions.

Q.—Since the department of social medicine is concerned with observations on people, should not its staff be recruited from practising clinicians ?

A.—It would be as unreasonable to deny a professor of social medicine the use of clinical methods as to deny a professor of surgery the use of a calculating machine ; but the professor of surgery who works mainly with a calculating machine is likely to persuade his faculty that it has appointed him to the wrong chair. In short, the professor of social medicine who proposes chiefly to exploit clinical methods would be more comfortable in a clinical department. His business, essentially, is to bring together the observations of many clinicians, to which on occasion he may find it useful to add his own.

Q.—What then are the essential requirements in a professor of social medicine ?

A.—Experience of many years in public health, industrial hygiene, and clinical medicine would be most useful ; it would also be practical if university teachers had four lives instead of one. In practice, until the new departments have had time to train staff specifically for this work, it will be difficult enough to make appointments if requirements are restricted to the following :

(1) An acquaintance with the standards of competent scientific work, acquired preferably in one of the fields of research.

(2) An imaginative grasp of the possibilities of large-scale research in medicine, and some experience in the conduct of field inquiry.

(3) Sufficient common sense to recognise that as his department will inherit responsibility for instruction in many subjects which his own experience does not include, he will require the support of a staff selected with an eye to his own deficiencies.

Until universities have in sight candidates who at least satisfy these minimal requirements, they would do well to delay appointments to full-time chairs. They need not delay consideration of their arrangements for social and preventive teaching, and may be encouraged to realise that much can be done through alternatives, intelligently adapted to local circumstances, which do not commit them prematurely to an ambitious adventure in a new department. It is equally important that they should recognise that the full-time department is not necessary for advance in teaching, and that success in teaching will not alone justify a full-time department.

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In England Now

A Running Commentary by Peripatetic Correspondents

THE formal sessions at international gatherings are notoriously unfruitful. The meetings are often too large, and the language bar too firm, for close-knit debate; moreover, delegates commonly speak from a prepared script which takes no heed of the trend of the discussion. At the first post-war conference of the International Hospital Federation, held in Holland last week, these handicaps, though evident, were minimised with the president, Prof. René Sand, in the chair. In these days of government by committee, there may be room for a chairmen's training-college; if so, Dr. Sand should be its first dean. Firm but never brusque, he cut short the loquacious with a gesture that succeeded without hurting; scorning the services of the expert interpreters, he would within half a minute give in French or English a lucid résumé of a 10-minute speech which had been delivered in any of three or four languages.

The discussions showed that almost every land has adopted, or is moving towards, the regional grouping of hospitals; and almost all lands share the same anxieties—there are too few hospitals and not enough nurses, the cost of construction and of operation is rising, and the desirable size and shape and life of new buildings are no less uncertain than ever. The conference revealed, too, a real desire for closer integration, particularly in the matter of research into hospital design; and the federation is to set up an international information centre in London, as well as study committees on hospital design and construction, administration, and patient care. If there are common troubles, there is also, as conversation made clear, a common misapprehension—that the National Health Service Act has already proved a disastrous experiment in social legislation. It seems that the newspapers of other democracies have given prominence only to the acknowledged difficulties; and these have become magnified. One European suggested that this gloom is being promoted in each country by the doctors. Anyhow it seems a pity that a venture which, though at present all-British, has such significance for the rest of the world should be consistently pictured as foundering. Has not the time come for the British Council to invite foreign legislators and journalists to see for themselves?

* * *

Most people don't object to going up in the world, but I must confess that it was with a feeling of reluctance that I joined the salmon-fishing classes. We humble trout-fishers have our pride. No skill, we say, in salmon-fishing. No upstream stalking of the individual rising fish, no skilful casting, no dropping of the dry fly in the exact spot in front of the quarry, no clever deception of the wild creature in its own element. Instead, a chuck-and-chance-it affair, and, if lucky, a battle of brute force. More often than not, a completely blank day devoid of incident. However, there was the river in perfect order, there was the right sort of weather, and it would have been churlish to reject such things. Knowing nothing of the relative merits of salmon flies I put on a Silver Doctor. It sounded a pretty killing sort of fly. All afternoon I fished slowly and carefully down the five allotted pools, and nothing happened. I had a cup of tea and debated whether to go on or try for trout. My host, who had been fishing higher up the river, appeared and asked if I had done any good. He showed me a nice clean nine-pounder in the back of his car. "When the sun gets off the water," he said, "try a Dusty Miller," and he went his way. The first two pools were blank, but at the bottom of the third pool something turned at my fly. Thanks to a slow reaction time I did not strike—and was into my first salmon. Far from human aid, with neither gaff nor tailer, not even a net, with my spaniel bitch barking hysterically and unhelpfully behind me, I fought the brute. He jumped and wriggled, flashing blue and silver, and my blood-pressure jumped with him. The river was too deep to get below him, so I had to lug him upstream towards a patch of shingle. At intervals he continued to jump or else to tear away across and downstream towards some broken water. If he got to it I knew I should lose him, so I hauled him savagely back, my trout rod bent in a semicircle. Sometimes he bore down to the bottom and just thumped and thumped. Then he got into the main current and hung on till I threw stones at him. After 25 minutes of agony I steered him into the shallows, got below him, and fairly chased him on to the beach, where, throwing down my rod, I fell on him, as one sits on a scrum-half, and clutched him to my breast. He was less than 8 lb. but a clean-run cock fish, and he was in the basket—or would have been if I had had one. Meanwhile my blood-pressure was in the region of 500 mm. Hg (estimated). There was pallor (I'm sure), clamminess of the skin, and dryness of the mouth. But the true purpose and meaning of life has been revealed to me: it is to kill salmon, on a trout rod, without benefit of gaff or gillie.

* * *

I yield to none in my dislike of the American Way of Life, and can agree with all your peripatetic correspondent of May 28 said about the extraordinary and often incomprehensible jargon used by American medical writers. But it should not be thought that British writers are above criticism. Consider this sentence from a British textbook: "Such a lesion may be complete and destroy all nervous structures within its limits, or partial, in which case it produces symptoms by disturbing, but not destroying, the anatomical integrity, and, therefore, the functional capacity, of cells and fibres, or by involving a certain number of them only." Few could understand it clearly at the first reading. In comparison, an American who said he treated his patients "on an ambulatory basis" makes himself sound illiterate but makes his meaning clear. "On writing for *The Lancet*" is not obtainable, but *Plain Words* by Sir Ernest Gowers is, and all medical writers should have to read it before sending anything for publication. I wonder if anyone has tried to persuade this son of a distinguished doctor to write a version of *Plain Words* for the guidance mainly of doctors instead of civil servants.

* * *

I remember reading a story—was it by Mark Twain?—of a man who possessed a note for a million dollars but died of starvation because he could not change it. In a minor degree I enjoyed a similar experience, happily for a limited time, in the United States zone of occupation in Germany. Treasury notes I had to the limit of regulations. Traveller's cheques had given me a comforting sense of financial security. Alarming disillusion soon ensued. So far as their purchasing value was concerned, I might as well have stuffed my pockets with pebbles. The hotels and bars offered attractive hospitality but only for dollar scrip. The English mess would accept only official notes—B.A.V.'s, I think they are called. One solution of the problem which would have produced board and lodging of a sort was to get arrested; though some ingenuity would have been required to select an illegal act which would command the maximum of consideration with the minimum of ignominy. In the end I recalled Lord Chesterfield's (I think it was) advice against running after your hat when it has suffered the attention of a high wind. Stand still, said he, and somebody will retrieve it. On this principle I adopted the appearance of extreme helplessness in the hope that something would turn up. Something did. But it would be indiscreet to elaborate.

* * *

I was busy trimming the onychogryphosis of the canon's wife with a pair of bone forceps; a task which has defeated every chiropodist in the district. Suddenly she said, "I often wonder what work you will be given in the next world, because, of course, medicine will not exist." That set me thinking and the more I thought, the more I became convinced that I should probably be just one in a vast army of unemployed and unemployables drawn from other professions besides my own. Which of the professions, indeed, *will* find applications for their skill? The Army? Hardly. The stage? The law? Not in my view of the after life. Only the theologians and musicians seem certain of a steady job.

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Letters to the Editor

LANGUAGE IN SCIENCE AND MEDICINE

SIR,—Until a very recent stage of man's history the search for knowledge was in the hands of a priesthood who guarded most carefully their privileged position. Often the power of this priesthood lay in the ignorance and superstition of those without the order. By the use of language unknown to most people they prevented knowledge from passing to the outsider.

After the Renaissance, English came to be used as the language of science and religion in this country, and knowledge was put within the reach of many more people. But today the growing complexities of science are causing a change in the reverse direction. In medicine, for example, each branch is building up a special and ever-increasing vocabulary, and this is producing a new series of priesthoods—the hæmatologists, the venereologists, the stereochemists, the biophysicists, the cytologists, the pure and applied mathematicians, the epidemiologists. The subdivisions of knowledge will lose much of their value unless the results of applying their special techniques are intelligible to others besides the various high priests.

Of late years books have been written to try to pass on the secrets of the new priesthoods, and these "popular" books show one way in which the problem has been tackled. Another possible solution appeared in the Services during the late war. This was a slang which covered both everyday and technical subjects; it was a live method which filled a gap. These examples illustrate two principles which could be used to prevent even greater chaos than at present: either language can be simplified or a new language can be evolved.

Ogden with Basic English has shown how speech can be simplified, and Hogben has suggested an international language of science with his *Interglossa*. Yet another, Bodmer, in *The Loom of Language* (p. 48) has emphasised the keynote: "The invention of the alphabet made it possible to democratize reading as the invention of the number 0 made it possible to democratize the art of calculation." An alphabet or a Basic English for science and medicine is a pressing need.

The realisation of this aim is not easy, but every editor of a journal can help by insisting on papers being written in the simplest possible language, and frowning upon new words which could easily be rendered in simple terms; every author can help by writing in simple language. It is asking too much to expect that specialised techniques can be so described that their features are at once understood by a worker in an unrelated field, but it is not asking too much to insist that the main lines of argument in a paper should be presented with consideration for the difficulty of a worker in another field.

Unless steps such as these are taken now by editors and edited, scientific and medical workers will soon be struggling in a bog of words. This is a system of planning which requires no committee, and the benefit to knowledge would be incalculable. The pedant has always been a butt for the wit. Now is the time to banish him firmly from the various branches of knowledge.

Department of Surgery, University of St. Andrews. JOHN GRIEVE.

DIAGNOSIS OF ANÆMIA IN CHILDHOOD

SIR,—In your leading article of May 28 you call attention to the need for coöperation between pædiatricians and those physicians who have made a special study of hæmatology. The article implies—and in my opinion rightly—that hæmatology is a branch of general medicine, not of clinical pathology. The hæmatologist should be just as much a physician as is the "diabetician"; and, like him, he must be master of a number of specialised methods of examination.

The article praises the special hæmatological clinic at the Boston Infants' and Children's Hospital, where in the past twenty years much has been added to our knowledge of blood dyscrasias in childhood. But the adult is at least as worthy of expert hæmatological care as is the child; and where in the United Kingdom is there a fully equipped hæmatological clinic for either juveniles or adults? I know the excellent work done in Manchester, in Edinburgh, and at Guy's Hospital; but there is nothing comparable with the hæmatological service of Paul Chevallier at the Hôpital Broussais in Paris. He has 100 beds, laboratories, lecture-theatres, and many assistants, some being technicians, some demonstrators, and others postgraduate students from all over Europe. True, he has no beds for infants, but it will not be long before these become available.

In this country, hæmatology, apart from clinical pathology, is a fairly new specialty, and it may be that, given time, an excellent service may develop; but there is no sound reason why we should start the race so far behind our French colleagues.

France, Switzerland, Italy, and Germany have their hæmatological societies; we have nothing more than some individual memberships of the International Hematological Society. It is to be hoped that something can be done to fill this gap.

London, W.1. A. PINEY.

TENOTOME FOR MARROW PUNCTURE

SIR,—I should like to draw attention to the value of the tenotome in bone-marrow puncture. At present it does not appear to be widely used in this operation.

After premedication and local anæsthesia of the skin and periosteum over the site chosen for puncture, it has been found desirable to nick the skin and subcutaneous tissue down to the periosteum by means of an Adams tenotome (manufactured by Down Bros. Ltd.). Blood and tissue fluid adhere to the blade for a variable distance from the tip. This distance gives a reasonably accurate measure of the depth of the soft tissues, which can vary greatly from case to case. The measurement is obviously of great use in estimating the position at which the guard of the sternal-puncture needle is to be set. It eliminates the variability due to depth of soft tissue, although, of course, one still has to guess the cortical thickness.

The use of the tenotome also obviates puckering of the skin, and usually some additional discomfort to the patient when the sternal-puncture needle is inserted through the skin without previous incision. The incision need only be very small, and, from our experience in some hundreds of cases, it heals just as well and quickly as the puncture-wound using the needle only.

We have found the tenotome just as useful in carrying out marrow punctures at sites other than the sternum —e.g., the ilium.

Royal Infirmary, Sheffield. E. K. BLACKBURN.

AIR DISINFECTION

SIR,—The work on disinfection of handkerchiefs reported by Dumbell and Lovelock in your issue of May 7 is of interest in bearing out our recommendation for the use of hexyl resorcinol as an aerial disinfectant.[1] Owing to the low vapour pressure of this compound, the aerosol particles have a long life, and ultimate gravitational settlement on surfaces should result in (*a*) disinfection of infected dust particles, and (*b*) continuance of disinfectant action on precipitated droplets. Point (*b*) is of importance in that hexyl resorcinol is slower in action in air than, for example, resorcinol with its higher vapour pressure.

The Rideal-Walker coefficients, of relative unimportance for aerosols, again enter the arena when surface sterilisation is required. We found that, in vitro, hexyl resorcinol was 150 times more potent than phenol against *Corynebacterium xerosis*, and as an aerosol 700 times as effective as the latter. Resorcinol has a negligible Rideal-Walker coefficient (0·3), yet is 60–70 times more potent in aerosol form than phenol.

The relative activity of surface deposits of these three phenols was clearly demonstrable when air sampling was carried out with the Bourdillon slit-sampler.[2] No evidence of activity on the surface of culture-plates was obtained when air treated with resorcinol 100 mg. per c.m. was sampled. With phenol at the same concentration slight

1. Twort, C. C., Baker, A. H., Finn, S. R., Powell, E. O. *J. Hyg., Camb.* 1940, **3**, 253.
2. Baker, A. H., Twort, C. C. *Ibid*, 1944, **6**, 382.

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bacteriostasis was shown. Hexyl resorcinol on the other hand exhibited bactericidal action on the surface of the agar with a mist concentration in air of 1 mg. per c.m. More recent work indicates that, when airborne *C. xerosis* emulsified in saliva is treated with hexyl-resorcinol aerosols (0·2 mg. per c.m.) and collected in dry sterile petri dishes, action continues on the surface of the glass, reducing the counts of survivors from 15% at 5 minutes to 0·2% 55 minutes later when the sterile agar was added.

Thus this compound should serve the dual purpose of disinfecting droplet particles, thereby reducing the number of infective dust particles, and also acting on pre-existing dust particles and those produced by the trituration of dried mucus, &c.

Goring-on-Thames, Oxfordshire. A. HOWARD BAKER.

STRONGYLOIDES IN EX-PRISONERS-OF-WAR

SIR,—Your annotation of May 14 refers to infection in men returned from prison camps in the Far East. Apparently, however, *Strongyloides stercoralis* or *Anguillula intestinalis* occurs sporadically in Europe and has pathological importance. This may be seen from the case I reported in *Gastroenterologia* (1948, 74, no. 3).

The patient was a woman, aged 27, who had never left Hungary. She had diarrhœa and violent pains referred to the gall-bladder. We found 52% eosinophil cells in the blood and *A. intestinalis* in the duodenal juice, where they moved like serpents. Cholecystography revealed normal conditions, and the larvæ were present in the fæces. The complaints were ascribed to duodenitis caused by the anguillulæ. The duodenitis resulted in dyskinesia of the gall-bladder. The skin was intact. As we found no portal of entry on the skin, infection per os was assumed. A single dose of tetrachlorethylene resulted in recovery and the eosinophil count became normal.

In this paper I pointed out that infestation by worms or protozoa should be thought of in all cases with vague abdominal complaints.

Korányi City Hospital, Budapest. L. FRIEDRICH.

WERTHEIM'S OPERATION

SIR,—I fully agree with Mr. Stallworthy's letter of April 23, including his views on coöperation between surgeon and radiotherapist in the treatment of carcinoma of the cervix. Unfortunately in many centres radium and X-ray therapy is available at only one hospital, and it is therefore impossible for those not on the staff of that particular hospital to try and carry out treatment on what would appear to be rational lines as laid down by Way,[1] and operate on those cases which after a trial of radium therapy appear histologically to be resistant.

I was interested to read that Mr. O'Sullivan (May 14) carries out a presacral neurectomy in some cases. I perform this as a routine when undertaking total hysterectomy for carcinoma of the body of the uterus. I also carried it out as the initial step in two Wertheim hysterectomies. The advantages in the case of Wertheim's operation are several. Firstly, the possibility of relief of visceral pain later. Secondly, the ease with which the ureters, particularly the right, are brought into view as they cross the common iliac vessels. When the infundibulo-pelvic ligaments are then divided, together with the broad ligaments, the ureters can easily be traced down to their entrance into Waldeyer's fascia and the bladder. This renders much easier the dissection of the regional glands without ureteric injury, and this dissection is completed before the uterus is removed. Thirdly, by better inspection of the ureter one can to some extent avoid damage to its blood-supply, which in the upper part enters chiefly from the lateral side and below medially by branches from the superior and inferior vesical and uterine arteries. It is unwise, therefore, to clean the ureter too meticulously in these situations. Fourthly, it may be of some advantage in preventing vasoconstriction of the vessels supplying the ureter in the post-operative period. Ureteric damage leading to fistula occurs in about 12% of cases in most series, and the damage is said to be usually not direct trauma to the ureter but to its blood-supply.

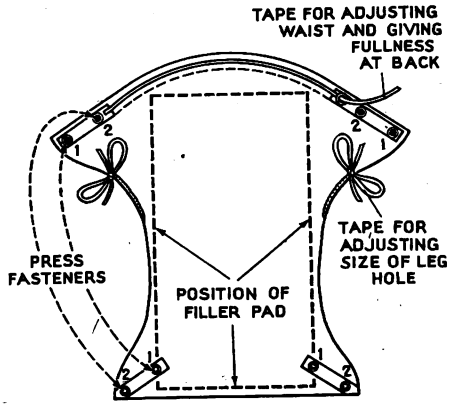
Manchester. D. C. RACKER.

1. Gluckomann, A., Way, S. *J. Obstet. Gynæc.* 1948, 55, 573.

THE NAPKINLESS AGE

SIR,—The container described by McKhann and Bricmont[1] is excellent in conception but appears unnecessarily complicated in design. There is already in this country a simple napkin holder,[2] devised as a result of practical experience by a mother of three children, which fulfils most of the criteria laid down in your note, and in addition is economical, since the disposable napkins cost less than the price of 30 cigarettes a week.

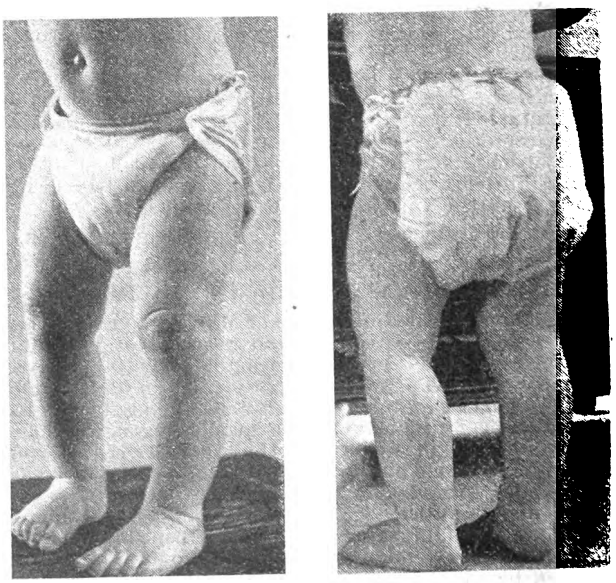
The filler pad is placed in a plastic container (fig. 1) which fastens round the baby. It has means of adjustment at the back for the waist, and at the sides for the legs. The overlapping of the corners, allows the leg-holes to telescope slightly with the movements of the baby's legs; and this gives freedom and air circulation without permitting liquid to escape. No area of plastic comes into continuous contact with the baby's skin, so maceration is prevented (figs. 2*a* and *b*).


TAPE FOR ADJUSTING WAIST AND GIVING FULLNESS AT BACK
PRESS FASTENERS
POSITION OF FILLER PAD
TAPE FOR ADJUSTING SIZE OF LEG HOLE
1
2
Fig. 1.

The holder can be used on babies from birth onwards and has been successfully used on over 100 babies for periods up to eighteen months, with no cases of eczema, intertrigo, or sore buttocks. I have used the holder on my infant son for some months, and can testify to its efficiency and to the comfort it gives the infant.

It is not claimed that the fæces are kept out of contact with the baby's skin, but the directions issued with the holder strongly emphasise the necessity for changing the pad if the baby has a motion, whatever type of filler is used. The disposable pad is made so that the urine soaks through the layer in contact with the baby's skin and is absorbed chiefly by the outer layer. The absorptive powers of the filler are considerably in excess of

1. McKhann, C. F., Bricmont, G. *J. Pediat.* 1949, 34, 131; see *Lancet*, May 7, p. 890.
2. Brit. Prov. Patent nos. 177, 8490, and 11913, of 1949; Brit. Reg. Design 857020, 857968–70.


(*a*) Fig. 2. (*b*)

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those of the ordinary napkin. These holders are shortly to be manufactured and sold on a large scale; but at the moment they are made by Mrs. Hunter Gordon, Balnagowan, Park Road, Camberley.

Frimley, Hants. QUINTIN MACLAINE.

CHILDREN IN HOSPITAL

SIR,—We were most interested in your leading article of May 7, but feel that one aspect of the problem has been omitted in discussing the difficulties of the child's resettlement at home. While in hospital the child has spent a large part of his time surrounded by other children with whom he plays, and inevitably on return home he misses the companionship of his new friends. Particularly is this so in the surgical wards, where more of the children are up; and it is borne out by the number of children who insist on a visit to their ward when brought up to outpatients.

MARGARET E. SAPP (Sister)
HUGH R. JOLLY.

The Hospital for Sick Children,
Great Ormond Street, London, W.C.1.

IATROGENIC EPILEPSY

SIR,—May I add a historical note to your leading article of May 21.

In 1915 Dr. S. Jellinek, of Vienna, in an article on Diagnosis of Epilepsy in Military Medical Practice,[1] reported that in persons afflicted with genuine epilepsy he could provoke typical fits by hypodermic injection of 5 cg. cocaine hydrochloride. This method had been suggested to him by the late Professor Wagner-Jauregg. With my fellow-worker, Dr. H. Pach, I was able to corroborate Dr. Jellinek's findings. We found that by hypodermic application of only 3 cg. of cocaine hydrochloride it is possible to induce various fits in 2–60 minutes after the injection. Detailed observation of such artificial seizures provided an easy and decisive method of differential diagnosis between genuine epileptic fits and seizures of Charcot's *grande hysterie* or so-called hystero-epileptic attacks.

We intended to continue our investigations on a larger scale; but after our preliminary report [2] we were ordered by the Vienna ministry of war to stop further experiments with cocaine immediately. The reason for the ministry's objection was, I believe, the risk that the method would be used by malingerers.

Budapest. LAJOS LÉVY.

KWASHIORKOR

SIR,—In her letter of April 23, Dr. Williams maintains that the rash in kwashiorkor differs in appearance and distribution from that of pellagra; and in this connexion she raises some puzzling questions, one of them being that the condition is rare in India and Malaya where malnutrition is prevalent.

May I be permitted to point out that the syndrome is not so rare in India? Cases have already been reported from the Bombay, Assam, and Andhra areas; and we have studied at the Nutrition Research Laboratories, Coonoor, 5 cases among the Tamils in South India.[3]

The patients, aged between six months and three years, belonged to the local plantation labour class, among whom diet surveys conducted by the laboratories from time to time revealed grossly deficient intakes of calories and essential nutrients. The rash was indistinguishable from that of pellagra and was confined to areas of friction such as flexures of joints, the inner aspects of the thighs, the perineum, and buttocks. The patients all had diarrhœa, anæmia, and œdema. Signs of riboflavin deficiency were present in four cases. One of them had aphonia that responded to parenteral administration of thiamine hydrochloride. The onset was sudden and the course rapidly fatal, this being unaffected by vitamin therapy including nicotinic acid.

It appears therefore that we are dealing with the same pattern of disease in India, and the evidence for the association of kwashiorkor with nutritional deficiency seems convincing. The involvement of areas of skin subjected to friction was regarded by Stannus [4] as characteristic of pellagra. The rash in our cases tended to resolve during the first few days of administration of nicotinic acid although the final outcome was fatal. Inasmuch as pellagra is regarded as a multiple-deficiency disease, this syndrome could still be called infantile pellagra as was originally suggested by Trowell. The differences in the pattern of the disease in infants and adults may be due to differences in tissue response at different ages, just as the infantile and adult forms of beriberi differ in the emphasis of certain clinical features. However, both from the point of view of prognosis and of its non-committal nature, the term "malignant malnutrition" now proposed by Trowell seems the least objectionable. Since achromotrichia is a rare feature in Indian cases, the term "kwashiorkor" is unsuitable.

V. RAMALINGASWAMI.

Laboratory of Human Nutrition, Oxford.

1. *Wien klin. Wschr.* 1915, no. 38.
2. *Gyógyászat* 1915, nos. 48–49.
3. Ramalingaswami, V., Menon, P. S., Venkatschalam, P.S. *Ind. Physician*, 1948, **7**, 229.
4. Stannus, H. S. *Lancet*, 1935, ii, 1207.

TWO WIGS

SIR,—On Sunday mornings my breakfast is enlivened by a perusal of the witty financial article that Mr. George Schwartz writes for the *Sunday Times*. Lately he wrote on having what you can afford:

"The greater part of my material welfare," he said, "has been and will continue to be made up by the second best, third best, and fourth best, simply because the first best is out of my reach. I appreciate a system which does not stipulate that only the very best is good enough for me, and has catered for my lower standards."

After reading this, I went on my round, and met a patient, an old man of 74, with a complete alopecia. For years he has worn a wig, and last autumn he came to me asking, since his was nearly worn out after five years' service, whether the State would supply a new one. I sent him to a dermatologist, and (after some delay) he obtained the necessary certificate.

But, to his surprise, he is to have two wigs, and although the firm of wigmakers is very busy (naturally!) the wigs must both be delivered at the same time.

Now my patient is a sensible old boy, and realises that in the natural course of events he may not have occasion to wear out two wigs. Also he realises with some apprehension (and so do I) that not only does he benefit from the health service but he pays for it (and so do I).

He wonders if we can afford a five-star service at a time when we are receiving outside help to restore our depleted resources.

In all other walks of life we don't say we must have only the best, but only as much of the best as we can afford. In medicine it is, rightly, different, and we all agree that for the sick the best should be afforded. But should this principle extend as far as wigs in duplicate?

ESAU.

*** We imagine that the decision to provide two wigs was based on the fact that from time to time a wig (if it is to carry any conviction) must be re-dressed. The possessor of only one wig would be much embarrassed while this was being done.—ED.L.

THE NEIGHBOURS' CHILDREN

SIR,—Your correspondent lives in a good-class suburb, and his neighbours' children are typical of such a milieu. The families in such localities have these characteristics: (1) they are small or one-child families; (2) the father is away from home from breakfast till evening; and (3) the mother is an educated woman who reads books on child psychology. A child in such a suburb will lack the benefits inherent in the companionship of a large family; it will also be brought up almost entirely by the mother. What this last type of upbringing means was shown during the war, when the father was absent from the home for many years.

I now come to the controversial subject of the effects of psychological reading on parents. I shall not discuss the excellence or otherwise of the many books on psychology. I can, however, describe the effect of such reading on many mothers and some fathers: it sicklies o'er the native hue of resolution with the pale cast of thought. A conflict is almost inevitable in the mind of a mother whenever she has to say "No" to her child and stick to it. Reasons for giving way to a child can always be found in psychological literature, if the mother

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means to find them—and she does mean to find them. Fortified by these rationalisations, she can, with a clear conscience, avoid the painful duty of enforcing discipline and character-training on her child.

The family doctor, by his advice, can, I think, do more than anyone to help such a parent to bring up her child in the right way. Many parents are grateful for this personal guidance.

Bridlington. P. D. H. CHAPMAN.

Parliament

Health Services in the Colonies

IN the House of Commons on May 27 Mr. CREECH JONES, Secretary of State for the Colonies, in moving the second reading of the Colonial Development and Welfare Bill, recalled that in 1945 Parliament increased the original sum available for this purpose to £120 million in the ten years ending March 31, 1956. The maximum which could be expended in any financial year was not to exceed £17½ million, and for research and inquiry schemes the ceiling was placed in any one year at £1 million. The Colonial governments were invited to draw up programmes for the ten-year period, and in the 21 territories in which development schemes had been approved to date the total expenditure planned was in the neighbourhood of £200 million. Of this sum the local governments were contributing £64 million by way of local loans and £71 million from their own local revenues. Something like £10 million was to be used for the development of agriculture and veterinary services; £9 million for health schemes; nearly £2 million for housing; £7 million for water-supplies and sanitation. Altogether the total for social services was in the neighbourhood of £29 million.

Over 300 schemes of research and inquiry had also been adopted. Expenditure was increasing each year as shortages of material and staff were overcome, new development schemes started, and new problems emerging. The expenditure last year was about £750,000, and the Government had plans for the coming year which would need about £1,600,000. It seemed clear therefore that more money must be forthcoming than was provided under the existing Act, and it was now proposed to raise the ceiling from £1 million for research and inquiry to £2½ million. This, of course, did not involve any increase in the total made available by Parliament over the ten-year period.

Industrial Health Services

In the House of Commons on May 31 the Prime Minister made the following statement: The Government have recently been considering the relationship between the National Health Service and the various health services at present provided in industry which make a call on medical manpower. In order to secure that the country's limited medical resources are used to the best advantage and with due regard to economy it is essential that these services should be organised so that there is no duplication or misdirection of effort. I have therefore appointed to advise the Government on this matter a committee, whose members are drawn from the industrial field, including both the management and the trade-union sides, and various branches of the medical profession. I should like to take this opportunity to suggest to all branches of industry that in view of this inquiry substantial further development of industrial health services should so far as possible be postponed until the committee's recommendations are available.

Colonel M. STODDART-SCOTT asked whether the Prime Minister would widen the scope of the inquiry so that the medical services of the Ministry of Pensions and the Ministry of Education could also be included and so avoid duplication. —Mr. ATTLEE: If we tried that it would delay a decision which is needed. Mr. G. W. ODEY: In view of the way in which the National Health Service is becoming completely overburdened, is it not important to the welfare and health of the workers of this country that the industrial health services should be preserved?—Mr. ATTLEE: I am quite well aware of that. The point is that we do not want to have overlapping.

The committee's terms of reference are:

"To examine the relationship (including any possibility of overlapping) between the preventive and curative health services provided for the population at large and the industrial health services which make a call on medical manpower (doctors, nurses, and auxiliary medical personnel); to consider what measures should be taken by the Government and the other parties concerned to ensure that such medical manpower is used to the best advantage; and to make recommendations."

The members of the committee are:

Judge E. T. Dale (chairman)	Dame Anne Loughlin, D.B.E.
Mr. John T. Byrne	Mr. J. H. Pheazey
Dr. T. A. Lloyd Davies	Dr. L. Roberts
Mr. R. R. Hyde	Dr. A. T. Rogers
Dr. Walter Jope	Sir Geoffrey Vickers, V.C.
Mr. K. I. Julian	

The joint secretaries are Mr. F. W. Beek, Ministry of Health, and Mr. C. H. Sisson, Ministry of Labour and National Service.

Staffing of Mental Hospitals

Replying to a debate on understaffing in mental hospitals, arising from the death of a patient at Rubery Hill Hospital, Mr. ARTHUR BLENKINSOP, parliamentary secretary to the Ministry of Health, said that the allegations made had caused distress throughout the country in the nursing profession. He had seen the depositions made to the coroner who inquired into the death of the patient. It was true that the ward in which the patient was receiving attention had no full-time attendant that evening, owing to shortage of staff; but it was visited on many occasions during the evening, so there was, in fact, a nurse in attendance most of the night. There was nothing in the evidence to suggest that the old lady was involved in the incident which occurred between two other patients in the ward the same evening. She was seen by a nurse immediately after that event took place and then appeared to be perfectly all right. The coroner, who sat with a jury, had returned a verdict of accidental death.

There was still, he added, no evidence of wrongful certification. Irresponsible statements impugning the conduct of the medical and legal professions should not be made by members of Parliament without careful investigation. The Government appreciated that nurses both in mental hospitals and in the general hospitals had suffered under real difficulties such as bad accommodation—appallingly bad in some cases. The question of pay for mental nurses was now under consideration by the Whitley Council and any recommendation they made would be retrospective to Feb. 1. In an instruction which the Minister issued to regional hospital boards in November, 1947, he stated that: "It is now commonly accepted that it is undesirable to certify old people, especially those over 70, suffering from mental infirmity, if certification can be avoided." The instruction went on to say that, except where it was essential to certify because the patients were too difficult to manage without this step, accommodation should be found for them outside the mental hospital service. The Government were fully aware of all the difficulties of accommodation at the present time, and they were doing their utmost to overcome them.

QUESTION TIME

Family Allowances

Replying to a question Mr. TOM STEELE, parliamentary secretary to the Ministry of National Insurance, stated that at May 9, 1949, approximately 2,910,000 families in Great Britain were receiving family allowances in respect of 4,600,000 children.

Disclaimed Hospitals

Colonel STODDART-SCOTT asked the Minister of Health how many hospitals had made application to him to be disclaimed from the working of the National Health Service Act; and in how many cases the application was successful. —Mr. A. BEVAN replied: 277 hospitals and clinics were disclaimed: and of those where application was made, 47 were not disclaimed.

Doctors' Lists

Replying to a question Mr. BEVAN stated that the average number of patients on a doctor's list in England and Wales is about 2200.

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Hospital Staffs

Mr. WALTER FLETCHER asked the Minister of Health how many members of hospital medical staffs in the Manchester region had been downgraded by means of a circular from the regional hospital board informing them that they can no longer be considered as specialists; and what was the consequent saving to the Exchequer; whether he would state the methods adopted by the Manchester regional hospital board and by their reviewing committee in assessing skill and competence and in judging the training, sacrifice, and intellectual capacity required for its attainment when recently determining the status of specialists; and why the specialists affected were not given any interview.—Mr. BEVAN replied: I will send the hon. Member a copy of the memorandum issued to boards on this subject. Mr. FLETCHER: Would not the Minister like to take this opportunity of stating to the House that he thoroughly disagrees with the discourteous methods used to medical officers of very long standing, which, if continued, will undoubtedly lead to a considerable upset in the working of his plans; and, furthermore, will he say how one can judge a man's intellectual capacity if one does not even give him an interview—not confusing intellectual capacity with debating skill?—Mr. BEVAN: I am quite sure that no discourtesy is intended. These reviews are made by purely professional committees, over which I myself have no direct control nor do I desire to have control, and they themselves determine whether in their judgment an interview is necessary. However, arrangements are being made for reviews of cases where objection is taken. Mr. FLETCHER: Will not the Minister disagree with this method of not hearing a man who, after 15 to 20 years' service, suddenly finds himself demoted and receives a circular not even properly signed?—Mr. BEVAN: There can be no question of being demoted, for this is the first review and demotion cannot indeed occur. As to whether an interview is necessary, this is a matter for the professional committee itself to decide. If the person concerned disagrees with the decision, he can make an appeal for a review to the same committee, which, however, will have added to it a doctor from the neighbouring area.

Sir HENRY MORRIS-JONES: Is the Minister aware that part of the grievance of these men is the fact that, when they make an appeal, they make it to the very men who came to the first decision? Clearly, ought there not to be an appeal to another impartial body?—Mr. BEVAN: As the body in itself, in the first place, is professional and impartial and contains all the professional knowledge required, it obviously would be redundant to have an appeal to another body having the same range of professional experience.

Rubery Hill Mental Hospital

Mr. A. R. BLACKBURN asked the Minister whether he had yet completed his inquiry into conditions at Rubery Hill Mental Hospital; and what steps had been taken in the meantime to ensure adequate staffing of the hospital.—Mr. BEVAN replied: The position is being fully examined in order to determine what further steps may be practicable to meet the staffing difficulties at this hospital. Mr. BLACKBURN: Is the Minister aware that there is no doubt whatsoever that all the people admitted to this hospital have either been certified on proper grounds or have been admitted without certification because of the great overburdening of the local hospitals in the area?—Mr. BEVAN: It is obvious that there is a very great shortage of accommodation for the chronic sick, especially for the old chronic sick. There has always been this shortage of accommodation. In the past, they had to live in workhouses for which there was no central responsibility in this House. We expected to have these questions, and we are very glad they are being asked because they throw a light on the needs of the problem.

Colonel STODDART-SCOTT: Is it not possible for patients to be admitted to mental hospitals as voluntary patients without being certified; and may I point out that no charges have been made that people have been wrongly certified, but only unnecessarily certified?—Mr. BEVAN: I do not know how the hon. and gallant gentleman draws a distinction between wrongly and unnecessarily certified. It is perfectly true that between 50 and 60% of the people who go into mental hospitals in this country do so voluntarily and without certification, which is itself a tribute to our mental hospital system.

Arundel Hospital

Mr. L. W. JOYNSON-HICKS asked the Minister of Health whether he had considered a copy of the resolution sent to him, which was passed at a mass meeting held in May at Arundel, protesting against the proposal to close the Arundel and District Hospital; and what action he proposed to take in the matter.—Mr. BEVAN replied: It is the Worthing group hospital management committee which has suggested that this hospital should be closed. The planning of hospital services is a responsibility of the regional hospital board and I should not consider any proposal which has not been the subject of a recommendation by the board.

Earl WINTERTON: Is the Minister aware that there is very strong feeling over this matter, which is not in any way directed against him or the National Health Act? Will he give sympathetic consideration to the matter, which has caused intense feeling, and see whether some compromise cannot be reached?—Mr. BEVAN: It must be understood that it was always intended that very small hospitals, where the service is not always competent and where the emotions of the local inhabitants are not the best test of the competency of the hospital service, should be closed down in the reorganised hospital service. I cannot be asked to sacrifice the welfare of the patients to local sentiment about a hospital. Mr. W. N. CUTHBERT: May I ask the Minister to use his influence in this respect? Some time ago we realised that there was a shortage of beds in the country, and particularly in this district, and although the Worthing Hospital authorities say they will be able to accommodate all the sick people from that district we ourselves know that they cannot. Will he look at it from that angle—that of the closing of beds?—Mr. BEVAN: I certainly would not permit any reorganisation to take place which would result in an absolute loss of accommodation in the area.

Foreign Qualification

Mr. D. L. RENTON asked the Minister whether he has considered the judgment of the Lord Chief Justice and other judges on the King's Bench Division in the recent case of Younghusband *v.* Luftig; and whether he intends to introduce legislation to clarify and modernise the Medical Acts, 1858 and 1886, and orders made thereunder, especially with regard to medical practitioners with foreign qualifications only.—Mr. BEVAN replied: I am considering the implications of this judgment, but I am unable to give any undertaking as to the introduction of legislation.

Confirmation of Provisional Registration

Mr. FREDERICK WILLEY asked the Minister how many applications for confirmation of provisional registration under sections 1 and 4 of the Medical Practitioners and Pharmacists Act, 1947, had been made; how many of these applications had been granted; and what was the reason for the delay or delaying with the remaining applications.—Mr. BEVAN replied: 29, of which 9 have been granted. As regards the others, the General Medical Council have not yet been able to complete the inquiries necessary to satisfy them that the statutory conditions are fulfilled.

Control of Infectious Diseases

Mr. J. A. BOYD-CARPENTER asked the Minister if he was satisfied that, in view of the increased and increasing speed of modern transport, he had adequate powers to control the introduction into this country of infectious diseases from overseas.—Mr. BEVAN replied: I am considering whether any further powers are needed. The general question of quarantine control will next month come before the second World Health Assembly. The problem is not simply to control infectious disease, but to control it with the minimum hindrance to traffic.

Dental Services

Sir WAVELL WAKEFIELD asked the Minister how many dentists were now operating the general dental service of the National Health Service; and what was the latest estimate of the annual cost of the general dental service.—Mr. BEVAN replied: There were 9347 dentists on the dental lists in England and Wales on May 1. The Ministry of Health Estimates provide £28,204,000 for the cost of the general dental service in England and Wales.

Mr. PHILIP PIRATIN asked the Minister of Education how many full-time and part-time dental officers, respectively, were employed in the school dental service in December, 1947, in January, 1948, and at the latest available date.—Mr. GEORGE TOMLINSON replied: The number of school dentists in January, 1947, was 382 full-time and 614 part-time, the total staff being equivalent to 753 full-time officers. In January, 1948, the corresponding figures were 411 full-time

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and 652 part-time, the full-time equivalent being 921. In January, 1949, the total staff was equivalent to about 866 full-time officers.

Meals for Elderly People

Mr. BARNETT JANNER asked the Minister of Food if he had now had an opportunity for examining the results of the experiment for which he granted a licence to Jarrow to enable old people to be provided with a prepared uncooked meal of meat, vegetables, and dessert; and whether he was now prepared to issue similar licences to other local authorities. —Mr. JOHN STRACHEY replied: When the Jarrow corporation proposed this most interesting experiment to my department we agreed with them to run it for a trial period of six months. It was accordingly started on April 25. I think I ought to wait at any rate till a rather longer portion of the trial period has elapsed before expressing an opinion on it.

Petrol for Hospital Car Service

Replying to a question Mr. H. T. N. GAITSKELL, Minister of Fuel and Power, stated that the amount of petrol granted to the hospital car service throughout the United Kingdom during the first quarter of 1949 was 225,026 gallons, as compared with 76,491 gallons for the corresponding period of 1948.

Obituary

JOHN CYRIL HOLDICH LEICESTER

C.I.E., M.D., B.SC. LOND., F.R.C.P., F.R.C.S.

Lieut.-Colonel Holdich Leicester, who died on May 19 at his home near Newbury, was for many years professor of midwifery and gynæcology at Calcutta Medical College and surgeon to the Eden Hospital.

Born at Scarborough in 1872, the son of the Rev. J. A. Leicester, he was educated at Dulwich College and University College, London, where he took his B.SC. with honours in physiology in 1893. Three years later he took his M.B. Lond., and in 1897 he proceeded to the degree of M.D. He held house-appointments at University College Hospital and the Samaritan Hospital for Women, and in 1898, after becoming F.R.C.S., he joined the Indian Medical Service. He saw service in China during the Boxer Rising in 1900, and during the 1914–18 war he served in Egypt, Mesopotamia, the Mediterranean, and Palestine. Later he was awarded a medal for his work in the Afghan war.

His appointment as C.I.E. at his retirement in 1927 was well deserved, for after these years of strenuous service he returned to Calcutta to continue his work there until he was 55. It was in this work that his real interest lay; and of his years in Calcutta his successor there, V. B. G.-A., writes: "Holdich Leicester was a delightful person to work with and one to whom I owe a debt for his kindness and forbearance in my early days. The son of the vicar of one of our City churches, he was a deeply religious man, noted for his punctilious work and close attention to all duties connected with the Eden Hospital. His gospel was patient and hospital first and then student and university. This creed he inherited from the fiercest and best of martinets, Charles Mortimer Green, now the oldest living fellow of the Royal College of Surgeons, and it was this same creed which he passed on to all who followed him at the Eden Hospital. I think it was as an administrator that he was at his very best, for he actually liked detail and committees, and I can recall the scores of work-hours and the unending subcommittees which the plans and building of the huge extension of the Eden Hospital necessitated for him. He loved to get details on to paper wherewith to confront the Pay Department and irritate the Surgeon-General and India Office. Outside hospital work his keenest interest was in the work of the Oxford Mission and the Calcutta Cathedral of which he was a vestryman."

For a time Colonel Leicester was acting surgeon-general of Bengal, and he also served a term as honorary surgeon to the Viceroy. In 1923 he was elected F.R.C.P. He married Queenie, daughter of the late Lieut.-Colonel E. Dobson, I.M.S.

Public Health

Deaths in 1947

THE medical tables of the Registrar-General's Statistical Review for 1947 [1] record that 515,591 civilians died in England and Wales during that year, an increase of 26,537 over the previous year. This gave a crude death-rate of 12·3 per 1000 civilian population, compared with 12·0 in the previous year and an average rate of 12·1 for the ten years 1929–38. Of these deaths, 144,570 were due to heart diseases and 77,649 to cancer. These two groups of causes thus accounted for 28·0% and 15·1% of the total respectively: in 1938 these proportions were 24·3% and 13·9%. February had more deaths than any other month (64,179).

Deaths due to *diseases of the coronary arteries* and angina pectoris showed an abnormal increase, numbering 33,168 in 1947 compared with 28,580 in the previous year and 15,409 in 1938. To get a true comparison between those two years it is necessary to discount the changes in the sex and age structure of the population: when this is done, it is shown that, taking the 1938 incidence as 1·000, the corresponding figures in 1947 are 1·851 for men and 1·765 for women. This indicates a total increase of about 80% in mortality attributed to this cause over the nine years.

Deaths from *cancer* show that male mortality is still increasing, and that the halt in the decline of female mortality, seen in 1946, was maintained. While for cancer of some sites, such as the mouth and pharynx, mortality is falling for both sexes, other affected sites show great increases. Among the 77,649 deaths from this cause, cancer of the lung contributed 9535 (7805 men and 1730 women), compared with 4658 (3609 men and 1049 women) in 1938. This accounts for three-fifths of the increase in male deaths from cancer.

The *infant-mortality rate* was 41 per 1000 related live births, compared with 43 in 1946, and was the lowest recorded in this country up to that time. It is now known that there was a further fall in 1948 to 34 per 1000 births (provisional). A new table in this review shows that, while Greater London had the low rate of 32, in Cheshire and Lancashire together it was 55, that the county boroughs as a whole had a higher average rate (50) than the urban districts or the rural districts at 40 and 37 respectively; of the county boroughs, Bootle had the highest rate with 93, followed by Warrington 85.

Deaths from *maternal causes* (excluding abortion) numbered 918, the first time the figure has fallen below 1000. The rate was 10·2 per 1000 live and still births, compared with 1·24 in 1946 and 2·70 in 1938.

Diphtheria deaths continued to fall, there being only 242 in 1947, compared with 455 in the previous year and 2622 in the peak war year 1941. Of every million children under fifteen years of age, 23 died from this cause. The corresponding figure for *scarlet fever* was 3; for *measles* 69 (compared with 22 in the previous year), and for *whooping-cough* 99 (compared with 91 and 79 in 1946 and 1945 respectively). There were 7103 civilian cases of *acute poliomyelitis*, and 484 deaths, compared with an average of 97 for the previous ten years.

1. The Registrar-General's Statistical Review of England and Wales, 1947, Tables, part I (Medical). H.M. Stationery Office. Pp. 360. 6*s*. (or post free from P.O. Box 569, London, S.E.1, 6*s*. 5*d*.).

Notification of Infectious Diseases

ENGLAND AND WALES

—	Week ended May			
	7	14	21	28*
Cerebrospinal fever	21	44	34	39
Diphtheria	87	90	92	100
Dysentery	59	77	55	85
Encephalitis lethargica	2	3	..	2
Food-poisoning	23	49	91	44
Measles, excluding rubella	9220	8363	8510	9583
Ophthalmia neonatorum	47	46	49	50
Paratyphoid fever	3	10	8	8
Pneumonia, primary or influenzal	494	406	441	485
Polioencephalitis	1	1	1	1
Poliomyelitis	13	11	11	19
Puerperal pyrexia	91	78	86	102
Scarlet fever	899	993	1110	1233
Smallpox	..	1	3	..
Typhoid fever	37	7	4	4
Whooping-cough	3054	2910	2838	2611

* Unrevised figures.

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Notes and News

A FULLER LIFE FOR THE OLD

A CONFERENCE on life in old age was held on June 1 by the London Council of Social Service. Miss G. Roberts pointed out that with the trend towards segregating people into categories went also a tendency to forget that the members of each group were also individual human beings; each should feel that he or she was in the full stream of life. Old age was largely a state of mind, and the aim of old people's clubs should be, not to coddle the members, but to make them feel part of society as a whole; in Goethe's words—"To grow old means to begin another occupation." Mrs. Hedley Prole saw the old people's club as a place where loneliness could be forgotten, friends made, and problems solved. The helper must above all genuinely love the aged, and should encourage members to run their own activities; they might, for example, visit the sick and bedridden. A meals service was invaluable.

Discussing infirmity in old age, Mr. Fred Messer, M.P., claimed that many were in hospital who should be at home, and many at home who should be in hospital. Dr. Trevor Howell observed that at St. John's Hospital, Battersea, the geriatric unit (which he directs) includes an outpatient department which has been established in an effort to help those waiting for a bed; the department, he said, also kept in touch with patients discharged from the hospital. This arrangement, together with vigorous treatment, had speeded the turnover and caused the waiting-list to dwindle. Dr. E. B. Brooke reminded the conference that in another twenty years one person in five would be over the age of 60. The British Medical Association's scheme for a coördinated medical service for old people hinged on the provision of long-stay annexes; but staffing these might prove difficult. The alternative was home care, on the lines of his experiment at St. Helier Hospital, Carshalton; here the greatest difficulty was in affording night nursing, and he thought that the voluntary organisations might be able to assist. A domiciliary laundry service would be a great boon. In summing up, Mr. Messer, who was in the chair, concluded that the lessons which had emerged were: (1) the need for closer integration between all organisations concerned with the welfare of the old; and (2) the difficulty of recognising the borderline between health and sickness in old age.

HOSPITAL CHAPLAINS' CONFERENCE

AT the annual conference of the Church of England Hospital Chaplains' Fellowship, under the chairmanship of the Rev. J. Gordon Cox, the Rev. G. B. Bentley suggested that in the relationship of the hospital chaplain to the staff and patients, the nurse was the key; he regretted the growing secularisation and the gradual lessening of the idea of vocation in the nursing profession, and also the decline in the proportion of trained nurses. So that patients might be treated as a whole, chaplains should take their place as knowledgeable members of the staff. The Rev. J. C. S. Chamberlain advocated the formation of intercession groups among the staff, patients, and church-people outside the hospital. The Rev. D. H. Boyling urged that ward services should last not longer than 15 minutes and should include carefully chosen hymns, simple prayers, and instructive addresses. He also suggested that the hospital chapel should be made the parish church of the hospital by using it on every possible occasion. The Rev. L. D. Jones (London Hospital) was elected secretary of the fellowship.

HOSPITAL COTS

A FEW weeks ago a baby aged 22 months squeezed his head between the bars of his cot in an isolation hospital and fatally dislocated his neck. The cot was one of a common type in which the distance between the bars is 4 in., except at each end, where there is a space $4^1/_2$ in. wide. A standard for children's cots is being drafted by the British Standards Institution; but pending its publication the Minister of Health suggests that hospitals should not buy new cots unless the filling bars for the head and foot ends and for the sides are placed at $3^1/_2$-in. or 4-in. centres, so that, using welded mild steel tubes of $^1/_2$-in. diameter, the minimum interspace between the bars is 3 in. and the maximum $3^1/_2$ in. In addition he asks hospital boards and management committees to see that cots already in use which do not comply with these conditions are reconstructed or adapted as soon as practicable. The possibility of accidents should meanwhile be eliminated by other precautions—e.g., by lashing 2-in. twine netting to the bars of the cot.

University of Cambridge

On May 28 the following degrees were conferred:—

M.D.—E. B. Davies, O. B. Appleyard, F. S. Carter.
M.B., B. Chir.—S. G. A. Forsyth (by proxy).

University of London

At recent examinations the following were successful:

Third Examination for M.B., B.S.—B. N. Bailey, Joyce M. Daws, I. E. Evans, J. E. Fay, K. A. Manley, Stanley Myers, Olive M. Riddle, H. H. Ronn, Gerald Westbury (with honours); J. D. Arneaud, Patricia Arnold, R. C. B. Arthur, J. McP. Ashley, F. R. St Cl. Assinder, C. L. Baker, J. H. Ballantyne, J. P. Barham, Rosemary E. Barker, June E. Bartlett, R. W. A. C. Barton, K. L. Batten, D. F. Bedford, Janet B. Bell, B. S. Bendeth, N. G. L. Bennett, Margaret V. Bickerton, S. H. Birchett, J. A. L. Bonnell, E. F. Bowers, T. K. Brandreth, T. B. Brewin, J. G. Brice, J. A. C. Brown, R. MacL. Brown, Ena K. Bruck, J. M. Brudenell, Richard Burtles, Prem Buri, Maria J. Cahn, June D. Cain, E. J. M. Campbell, K. J. M. Carruthers, R. H. Carruthers, L. S. Carstairs, J. K. Carter, M. J. Catton, David Charles, B. G. B. Christie, Joseph Colquhoun, M. B. Comerford, Annette M. L. Constantin, P. B. Cook, G. A. Coombs, W. E. Cooper, R. E. Cotton, K. J. Covell, D. N. Cow, W. H. Craike, I. B. Crawford, June D. Cross, Phyllis A. M. Crozier, Patricia Q. Currie, J. A. Daff, A. J. Davies, Margaret K. Douglas, Romola D. Dunsmore, R. N. Ebbing, D. A. Ellerton, I. L. Evans, I. B. T. Evans, J. H. Evans, H. B. F. Fairley, Simeon Fernando, Doreen C. Finch, B. L. Finer, Margaret M. F. FitzPatrick, Barbara J. Fleming, Peter Flintan, M. O. Forster, A. W. H. Foxell, Yvette A. P. Franklin, P. N. Gai, P. S. Gardner, L. K. Garstin, Edward Gellatly, D. D. Gellman, H. J. Giweib, R. W. Glenn, J. E. S. Gould, S. H. Gould, N. D. Gower, A. A. Graham, J. M. Graham, P. J. Grant, J. T. Groves, G. W. Hadfield, M. H. Handoll, Robert Handy, M. J. Harman, Josephine Harper, J. W. S. Harris, Andrew Herxheimer, N. L. Higgins, J. F. Hindle, J. M. Hinton, J. J. B. Hobbs, A. C. S. Hobson, J. P. S. Hodges, Henry Hollis, Margaret A. Holroyde, Margaret C. Horder, Peter Howard, A. J. C. Hyde, Margaret O. Jago, D. T. R. James, Oliver James, J. L. Jarvis, D. G. Jenkins, R. L. Jillett, William Johnson, Arthur Jones, J. A. B. Jones, J. F. Jones, E. R. Jordan, D. W. Kennard, Sylvia Kershaw, L. C. Kreeger, Ursula M. Kynoch, B. S. Laing, J. M. Lancaster, Michael Lauchlan, L. F. Levy, A. J. Lewis, M. J. Linnett, C. J. Lucas, Elizabeth G. S. McDowall, A. E. McLauchlan, A. K. Mant, A. R. C. Margetts, Joan Marshall, M. D. Mehta, G. H. C. Melotte, A. H. Mendoza, G. G. Meynell, Leslie Michaels, D. D. Miller, Margaret R. Miller, O. T. L. Morgan, D. D. B. Morris, V. C. Morris, M. R. Murley, C. H. Neaves, G. F. Newbold, R. G. Nicholson, K. C. Nyman, P. O. Oliver, K. I. Padget, W. K. Pallister, M. C. Peterside, A. H. Phillips, N. H. Porter, Betty E. Powe, F. J. Powell, D. L. Pryer, Colette L. Raulin, P. A. Reed, H. H. Richards, A. E. Richardson, Peter Roberts, Margaret Rogers, F. C. Rose, I. P. Ross, S. S. Rowell, Marian W. Ruscoe, J. L. Russell, A. J. Salmon, K. M. Saunders, P. D. Saville, Muriel J. Scudamore, G. T. Smedley, D. W. Smith, R. W. Smithells, G. J. Sophian, M. H. Southall, Jean P. Spalding, G. C. Squires, E. J. Stafford, H. B. Stafford-Kemp, Lorna C. Stanfield, Harold Sterndale, J. A. B. Stewart, A. G. I. Stockley, David Stubington, M. H. Symes, Pamela C. Tatham, A. W. Taylor, Bernard Taylor, Brenda A. Taylor, G. B. Taylor, J. B. Taylor, E. T. Thomas, K. D. W. Thomas, R. G. Thomas, J. M. Titmas, D. O. Topp, Rita D. C. Tozer, J. C. L. Wade, C. S. Ward, Catherine A. Warrick, J. A. G. Watson, J. R. Watson, M. A. Weller, J. H. McN. White, William Whittingham, D. R. C. Willcox, J. D. Williams, J. L. Williams, Molly T. Williams, Frank Wilson, Josephine P. Winter, W. J. Wright, F. R. H. Wrigley.

Royal College of Physicians

Dr. J. H. Sheldon will deliver the F. E. Williams lecture at the college, Pall Mall East, London, S.W.1, on Tuesday, July 12, at 5 P.M. He is to speak on the Rôle of the Aged in Modern Society.

Addison Lecture

The third Addison lecture will be delivered in the physiology theatre, Guy's Hospital medical school, on Thursday, June 23, at 5 P.M., when Sir Henry Dale, O.M., F.R.S., will speak on Thomas Addison—Pioneer of Endocrinology. Sir Herbert Eason will be in the chair and applications for tickets should be made to the dean of the school, London, S.E.1, by June 16.

Society for Relief of Widows and Orphans of Medical Men

The annual general meeting of this society was held on June 1, with Dr. Alison Glover, a vice-president, in the chair. At present the membership is 250, 46 widows are in receipt of grants, and the total sum distributed during the year was £4545. Income exceeded expenditure by £800. It was decided that by-law 48 should be amended so that any widow whose annual income does not exceed £150 will be eligible for grants as compared with £125 at present. Membership is open to any doctor living within a 20-mile radius of Charing Cross and further details may be had from the secretary of the society, 11, Chandos Street, London, W.1.

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Register of Chiropodists

The 1949 edition of the register has now been published and doctors may obtain a free copy from the registrar of the Board of Registration of Medical Auxiliaries, Tavistock House North, Tavistock Square, London, W.C.1.

Rye Flour for Patients Allergic to Wheat

Patients who are allergic to wheat or wheat-flour extracts need no longer produce a medical certificate to obtain supplies of rye flour. Such patients should try to get rye flour from a retailer in the normal way. If they have any difficulty they should seek advice from the local food office.

Oxford Graduates' Medical Club

The summer dinner of this club will be held in Brasenose College, Oxford, on Friday, July 15, when Prof. A. D. Gardner will be in the chair. Further particulars may be had from Mr. E. G. Tuckwell, 73, Harley Street, London, W.1.

Locum Register for Tuberculosis Institutions

The National Association for the Prevention of Tuberculosis is to set up a register giving the names of doctors looking for temporary positions in tuberculosis clinics and sanatoria, together with a brief note of their medical qualifications. Those who wish locum work of this kind should get in touch with the association, Tavistock House North, London, W.C.1.

Alexander Pigott Wernher Memorial Trust Fund

An allocation of £4000 per annum from this fund has been made for the award of travelling fellowships or grants.

The fund has been set up to further "the prevention and cure of blindness and deafness in the United Kingdom and British Empire, and in particular research in connexion therewith by financing medical men and students within the Empire to study methods and practices in all countries of the world," and the awards will be made primarily for research in ophthalmology and otology, for periods of up to a year, but grants may also be given for short-term visits abroad to study new methods of investigation and treatment in these fields.

Applications should be sent to the secretary of the Medical Research Council, 38, Old Queen Street, London, S.W.1.

Certificates of Incapacity for Hospital Outpatients

The Ministry of Health has informed hospital authorities that in future certificates of incapacity for work required by the Ministry of National Insurance shall, where applicable, be issued by hospital outpatient departments in respect of patients attending these departments. The first and final certificate must be signed by the doctor in attendance, but intermediate certificates may be signed by the authorised lay officers. At present, says a Ministry circular, patients are often referred back to their general practitioners for the issue of certificates. This procedure, though it accords with the notes on the covers of certificate pads, places a needless burden on the patient and on the general practitioner.

Personal Necessities for Hospital Patients

A Ministry of Health circular reminds hospital authorities that for patients maintained without charge in hospital under the National Health Service the rate of National Insurance benefit is reduced; while patients who have no benefit or pension from the Ministry of National Insurance and no means of their own may receive a comforts allowance of 5*s*. a week from the National Assistance Board. "These provisions have thrown into relief the question of the extent to which hospitals should provide their patients with the non-medical necessities of life and with minor luxuries." While leaving decisions to individual authorities, the Minister suggests that for all patients who do not prefer to supply their own, certain elementary consumable articles should be provided as part of their ordinary maintenance in hospital; these include toilet requisites and the services of a barber, a reasonable supply of notepaper on request, and a selection of newspapers and magazines in the wards. Other articles may be supplied on loan—e.g., towels, hairbrushes and combs, and, where necessary, night and day clothing. With protracted stay in hospital, the range of articles provided at Exchequer cost may reasonably be extended, to include particularly renewals of articles, such as toothbrushes, that initially the patient could be expected to provide himself. "Generally, committees and boards should aim at achieving, in this field, a mean between austerity and luxury, ensuring in particular that patients whose benefit . . . has been progressively reduced to the minimum do not find themselves thereby deprived of any essential need of mind or body."

London College of Osteopathy

A nine months' postgraduate course for registered medical practitioners will begin at the college in October. Particulars may be had from the secretary, 25, Dorset Square, London, N.W.1.

Operation Televised in Colour

B.U.P. reports that at the Pennsylvania University Hospital an operation has for the first time been televised in full colour. Television has lately been introduced as an aid to teaching in the department of surgery at Guy's Hospital, London (see *Lancet*, May 21, p. 874).

Handling of Meat

The working party on meat products set up by the Ministry of Food, in consultation with the Secretary of State for Scotland and the Minister of Health, to consider hygiene in the trades concerned with the manufacture of meat products, includes: Dr. W. A. Lethem, Dr. A. H. Gale, Dr. I. N. Sutherland, Dr. D. C. Lamont, and Dr. W. R. Martine. Dr. J. A. Boycott is one of the assessors to the working party.

An interdepartmental committee has also been set up to consider the arrangements for the inspection of home-killed meat and the certification of imported meat. The members include Dr. W. A. Lethem and Dr. E. L. Sturdee.

Mr. P. B. Medawar, F.R.S., professor of zoology in the University of Birmingham, has been appointed a member of the committee of inquiry on cruelty to wild animals appointed by the Home Secretary.

Diary of the Week

JUNE 12 TO 18

Monday, 13th

MEDICAL SOCIETY OF LONDON, 11, Chandos Street, W.1
8.30 P.M. Films will be shown on the History of the Cinema Film in Medicine; Angina Pectoris; Removal of Foreign Bodies from the Eye.

Tuesday, 14th

UNIVERSITY OF LONDON
5.15 P.M. (University College, W.C.1.) Prof. A. V. Hill, F.R.S.: Muscular Contraction. (Last of three lectures.)

Wednesday, 15th

INSTITUTE OF CARDIOLOGY
5 P.M. (1, Wimpole Street, W.1.) Prof. K. D. Wilkinson: Withering. (St. Cyres lecture.)
WEST LONDON HOSPITAL, Hammersmith
8.30 P.M. (11, Chandos Street, W.1.) Mr. R. C. Brock: Surgical Treatment of Congenital Pulmonary Stenosis. (Alex Simpson Smith lecture.)
ST. MARY'S HOSPITAL MEDICAL SCHOOL, W.2
5.30 P.M. (Wright-Fleming Institute.) Dr. Leon Unger (Chicago): Treatment of Bronchial Asthma.

Thursday, 16th

ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE, 26, Portland Place, W.1
7.30 P.M. Dr. R. V. Talice (Montevideo): Film on Chaga's Disease.

Friday, 17th

ST. GEORGE'S HOSPITAL MEDICAL SCHOOL, S.W.1
4.30 P.M. Dr. Anthony Feiling: Neurology lecture-demonstration.
FACULTY OF RADIOLOGISTS
10 A.M. (University of Sheffield.) Opening of annual meeting.
BIOCHEMICAL SOCIETY
2 P.M. (University of Nottingham.) Short papers.

Births, Marriages, and Deaths

BIRTHS

CLEMENT.—On May 27, at Norwich, the wife of Dr. M. H. Clement—a daughter.
MENZIES.—On May 31, at Birkenhead, the wife of Dr. Alexander Menzies—a son.
THORNLEY.—On June 1, in Manchester, the wife of Mr. Roland Thornley, F.R.C.S.E.—a son.

MARRIAGES

BEVERIDGE—HART.—On May 28, in Edinburgh, William John Morton Beveridge to Elsie Hart.

DEATHS

FROST.—On June 1, at Reading, Austin Thomas Frost, O.B.E., M.B. R.U.I., lieut.-colonel, R.A.M.C. retd, aged 71.
GRAYLING.—On May 31, Arthur Grayling, M.B. Lond., aged 91.
MCALLEN.—On May 31, at Llanwern, Thomas John McAllen, M.B. R.U.I.
ROSENBLOOM.—On June 1, in Glasgow, Alfred Rosenbloom, M.B. Edin., D.T.M., colonel, I.M.S. retd, aged 46.

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JUNE 18, 1949 PAGES 1031 TO 1078

THE LANCET

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THE MENSTRUAL CYCLE *

S. ZUCKERMAN

C.B., M.A. Oxfd, M.D. Birm., D.Sc. Lond., F.R.S.

PROFESSOR OF ANATOMY IN THE UNIVERSITY OF BIRMINGHAM

THE main structure of our knowledge of the physiology of menstruation was established during the inter-war years. Its keystone is the fact, first demonstrated by Allen (1927), that uterine bleeding occurs as a "withdrawal" effect when œstrogen ceases to act on the endometrium. On the basis of this observation, and the knowledge that œstrogen is normally responsible for proliferative, and progestogen for secretory, effects it has proved possible to arrange experimental conditions which simulate the histological changes in the uterus during the normal menstrual cycle, and in which uterine bleeding occurs at about 28-day intervals (Zuckerman 1937a, b, and c).

These and corresponding observations provide most of our standard information about the control of the menstrual cycle. Before dealing with more recent developments, it is useful to outline some parts of the picture the older observations convey, and to consider certain issues which still remain somewhat controversial.

TIME OF OVULATION

The first point that needs to be emphasised is the time of ovulation. The most widely accepted view is that this takes place at some point about the middle of the menstrual cycle. This conclusion first emerged from observations of endometrial changes in the human uterus (for general review see Hartman 1936). Today it rests upon a wide variety of direct and indirect evidence not only in women but also in several species of monkey and ape, all of which have essentially the same kind of menstrual cycle.

Under direct evidence in both man and the subhuman primates are included (1) inspection, both naked-eye and histological, of the ovaries at different times of the cycle; (2) the evidence of controlled matings in man (Latz and Reiner 1942) and in rhesus monkeys (Hartman 1932, Van Wagenen 1945); and (3) the recovery of tubal ova in man (Allen et al. 1930, Hertig and Rock 1944, Rock and Hertig 1944, 1948) and in monkeys (Allen 1928, Hartman 1936).

Under indirect evidence may be classified an extensive series of observations which indicate that the first half of the menstrual cycle is associated with physiological conditions different from those characteristic of the second, and observations which suggest the occurrence of some abrupt change about the middle of the cycle. The more important of these observations are as follows:

1. In both man and monkey the endometrium in the first half of the menstrual cycle is in the proliferative phase, indicating œstrogenic action, with characteristic tubular glands; in the second half of the cycle it is secretory, indicating the action of progestogen, with large sacculated glands.

2. The spontaneous activity of the human uterus varies with these two phases (Wilson and Kurzrok 1938). Knaus's (1934) original finding that the myometrium is refractory to 'Pituitrin' in the second half of the human menstrual cycle has, however, not been confirmed (Henry and Browne 1943, Moir 1944).

3. The amounts of œstrogen and pregnanediol in the blood and urine of women show characteristic differences between the two phases of the cycle (Venning and Browne 1937). Thus the concentration of œstrogen in the urine increases to a maximum for a few days about the middle of the cycle, a second peak occurring just before menstruation. Pregnanediol, which is not found in the urine in the first phase of the cycle, is present during the second.

4. There is a sudden and abrupt concentration of gonadotrophin in human urine about the middle of the cycle. Consequently, if rats are injected with 2 ml. of morning urine at this time their ovaries become hyperæmic (Farris 1946).

5. The vaginal pH is usually lower in the first than in the second half of the cycle (Rakoff et al. 1944), a change which parallels the less well-defined cyclical alterations that occur in the cellular content of the human vaginal smear (Papanicolaou 1933, de Allende et al. 1945).

6. The average basal body temperature of women is lower in the first than in the second half of the cycle, and the transition between the two levels as a rule occurs abruptly about the middle of the cycle (Barton and Wiesner 1945).

7. Some women also experience an abrupt attack of localised pelvic mid-interval pain (*Mittelschmerz*). Krohn (1949) suggests that in women this pain may occasionally provide a better index of some physiological event, presumably ovulation, than does any other indirect sign. That this belief is not without foundation is shown by findings at operation in women whose ovaries have been examined at the height of the mid-interval pain. For example, eight of fifteen cases reported by Wharton and Henriksen (1936) showed clear evidence of recent ovulation.

8. There is sometimes a slight show of blood ("intermenstrual bleeding" or "spotting") at about the mid-point of the cycle.

9. Cyclical fluctuations are seen in the "sexual skin" in monkeys and apes. This specialised area of skin is contiguous with the external genitalia and is a characteristic of only some species of monkey and ape. It is quiescent at the time of menstruation and begins to swell immediately or soon after bleeding stops. The maximum of swelling is reached shortly before the middle of the cycle. The skin then suddenly collapses, and remains in a quiescent state through the second half of the cycle (Zuckerman 1930). Swelling is associated with the retention of a great deal of water (in individuals of some species as much as 25% of the body-weight). Conversely, collapse of the skin is associated with an abrupt increase in the amount of urine excreted, the volume of urine in the second half of the cycle being much greater than in the first (Krohn and Zuckerman 1937).

This catalogue of evidence showing that the physiological conditions of the first and second halves of the cycle are different is in no sense complete. But it does indicate that the view that ovulation is a mid-interval phenomenon is widely based. All these indirect observations add up only to the general conclusion that at some point in the middle of the cycle a change regularly occurs in a number of structural and physiological characteristics of the body. It is legitimate, however, to go a step further, and to relate the physiological conditions of the first half of the cycle to the effects of œstrogenic stimulation, and those of the second half to progesterone, for experiment has clearly shown this to be true in the case of the endometrium, sexual skin, and vaginal pH. In so far as œstrogenic stimulation is broadly related to the pre-ovulation phase of the follicular cycle, and the effects of progesterone to the post-ovulation or luteal phase, it seems fair to relate all the changes that have been discussed to the occurrence of ovulation at some moment during the mid-interval.

This statement is no more than a broad generalisation. There are exceptional but reliable records of ovulation occurring in women, and in monkeys, at times far removed from the middle of the cycle. For example, in a large series of artificial inseminations Seymour (1947) found that $2^1/_3$% of women became pregnant only when inseminated before the 7th day of the cycle. Similarly, Van Wagenen (1947) has noted that 4% of macaques mated only on the 6th day of a cycle conceived. Conversely, there is evidence that ovulation can be delayed to the 3rd or 4th week of the cycle in healthy rhesus monkeys (Rossman and Bartelmez 1946). All these observations relate, however, to menstrual cycles of presumably abnormal duration, and in general it may be taken that ovulation usually occurs about the mid-point of cycles that last about 28 days.

* The substance of a lecture given on Jan. 12, 1949, at the Institute of Obstetrics and Gynæcology, the Chelsea Hospital for Women, London.

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PHASES OF THE MENSTRUAL CYCLE

A menstrual cycle is the interval between the onset of two successive periods of uterine bleeding. It is well known that the length of the interval varies considerably both between different women and in the same woman from time to time. It is also recognised that the menstrual cycle is longer and more irregular at the onset and close of reproductive life. It is, however, fairly well established that the modal length of the cycle—i.e., the length of the most frequent duration of cycle in any extensive series of observations—is about 28 days, though the modal length may not occur in more than about 10% of cases. The average length of the cycle is usually longer, and in very few series of data has it turned out to be less than about 30 days.

Of the two phases of the cycle both the direct and indirect evidence that have already been considered suggest that the preovulatory is more variable in length than the postovulatory. This means that the preovulatory phase is usually short in cycles shorter than the average, and longer than 14 or 15 days in cycles longer than the average. As a general rule, it may be taken that the postovulatory or luteal phase lasts some 14 days, irrespective of the length of the cycle.

This general conclusion has been established on the basis of a variety of observations on subhuman primates (Zuckerman 1937d, Corner et al. 1945) and in man (Latz and Reiner 1942). Krohn's observations (1949) on the periodicity of the *Mittelschmerz* also suggest very clearly that the postovulatory interval varies significantly less than the preovulatory, and this conclusion is also supported by the data on human ova presented by Rock and Hertig (1948).

Very rarely the postovulatory phase, both in man and monkey, is prolonged beyond the usual limits. This may result either from an undue persistence of the corpus luteum (Corner 1942) or perhaps occasionally from an unusually slow and irregular regression of the endometrium, as suggested by Brewer and Jones (1948) from a study of pathological human material. The corresponding extension of the follicular phase has been attributed by Rossman and Bartelmez (1946) to inactivity of the ovaries at the start of a cycle.

In the past various workers have commented on the fact that the luteal phase, which in the normal menstrual cycle may be taken to last about 14 days, does not vary greatly in length as between different species of mammals, irrespective of differences in size or in the character of the œstrous cycle. Eckstein (1949) has reviewed the evidence that bears on this point. According to the data he has assembled, the life-span of the corpus luteum in different mammals varies between 10 and 20 days, and in the great majority of animals between 10 and 15 days. In the rat and mouse the shortness of the cycle as a whole is correlated with the unusually short functional life of the corpus luteum in these species (about 3 days). However, when pseudopregnancy occurs, the life-span of the corpus luteum is extended to 10–14 days.

It would be quite unnecessary to labour all these facts and conclusions were it not for the somewhat critical attitude adopted by Davies (1948) towards the general conclusion that ovulation usually occurs about the middle of the cycle, and that in time it is more related to the onset of the succeeding than to that of the preceding menstruation. Davies focuses his comments on observations of the endometrium and on the recovery of early embryos or ova at different times of the human cycle. His main point is that inferences about the time of ovulation from such observations assume, what is by no means necessarily the case, that the cycle in which the observation was made, and which was artificially interrupted to make the observation, would have been of the same length as the immediately preceding one. This is a logical objection, but Davies implies that ovulation is not necessarily related to the time of menstruation. The direct evidence about the time of ovulation, relatively scanty though it may be, however, points far more in this than it does in any other direction. When buttressed by the much wider field of indirect observation, no other conclusion at all seems possible.

From one point of view, however, Davies is clearly right. The clinician has no easy means of judging exactly when ovulation is about to occur, is occurring, or has just occurred. The direct and indirect observations that have been referred to above merely provide a basis for a statistical assessment of the period at which ovulation is most likely to occur in any given woman, provided that one has information about the periodicity of the cycle in that particular individual.

Since there is no reliable easy "test" for the occurrence of ovulation, it still remains true, therefore, that the method suggested by Knaus (1934) for estimating the time at which it is most likely to occur remains the most convenient which the clinician can apply. The first step is to establish, over as long a period as is convenient, the variation that occurs in the duration of the cycle in the woman concerned. On the assumption that the postovulatory phase lasts 14 days, 14 days is then subtracted from the length of the longest cycle observed, and 14 from that of the shortest. Since there is no way of telling the length of any subsequent cycle, ovulation is presumed to be possible at any time in the interval defined by the two subtractions. For example, if twelve successive cycles in a woman vary between 27 and 34 days, it must be presumed that in the cycle or cycles which lasted 34 days ovulation occurred about the 20th day, and that in the cycle or cycles which lasted 27 days ovulation occurred on the 13th day, after the onset of menstruation. From this it follows that in any future cycle ovulation can be expected any time between the 13th and 20th days after uterine bleeding begins.

MENSTRUAL CYCLES WITHOUT OVULATION

Since menstruation can occur in the absence of ovulation, the duration of the two phases of the cycle clearly does not necessarily determine the total length of the cycle. Like irregularity, cycles without ovulation are particularly frequent at the beginning and end of reproductive life (Hartman 1932, Ashley-Montagu 1946). They also occur from time to time in healthy non-pregnant women. The frequency of their occurrence has not yet been determined, but Sharman (1944) found that some 6% of women examined because of sterility were having menstrual cycles without ovulation. Rock and Hertig (1948) found that only 25% of 104 women who had coitus at the expected time of ovulation conceived.

There is no evidence to suggest that menstrual cycles without ovulation differ in length from those with ovulation. The presumption is, therefore, that the normal periodicity of menstruation, though depending on changes in the ovaries, does not depend on rupture of a graafian follicle. In other words, it follows that ovulation, and the subsequent formation and functioning of a corpus luteum do not necessarily play the primary rôle in the control of uterine periodicity. The significance of this fact will become clear when the question of an underlying cyclical rhythm of the uterus is considered.

FACTORS INFLUENCING MENSTRUAL PERIODICITY

Since it is impossible to predict exactly the duration of any menstrual cycle, it is obvious that the factors responsible for menstrual irregularity cannot be defined. It is well known that emotional disturbances may disorganise the menstrual rhythm, but the way in which

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a cycle is affected varies from one woman to another. In some instances uterine bleeding may be considerably delayed, and in others accelerated, as a result of psychological disturbances or sudden shocks. It seems safe to assume that minor emotional disturbances may be responsible for minor variations in the menstrual rhythm. In view of the relative constancy of the postovulation phase of the cycle, it also seems reasonable to suppose that such disturbances operate by affecting the time of ovulation.

Though little is known about this, there is ample experimental evidence to show that the ovarian mechanism, and therefore the uterine, can be temporarily thrown out of gear by disturbances in relatively few of the preganglionic nerves by which the ovaries are served. The experiments on which this conclusion is based (Zuckerman 1938a) showed that the female internal reproductive organs will respond as readily to general neurovascular changes as they will to neurovascular changes that affect them specifically. They also show that the reproductive organs can be affected by interference with either sympathetic or parasympathetic nerves. It should be noted that there is a rich vascular anastomosis between the ovaries and the uterus. Vasomotor changes in the one organ would almost certainly induce reciprocal or corresponding changes in the other. Though bleeding cannot be induced by division of neural structures in spayed monkeys, the possibility that some primary vasomotor change occurs in the uterus after neural lesions cannot therefore be excluded. Moreover it is conceivable that the sensitivity of the uterus to œstrogenic stimulation is affected by changes in its vasomotor condition.

Whether or not a paralysis of ovarian secretory nerves is concerned in this type of uterine bleeding remains an open question.

UTERINE PERIODICITY IN THE ABSENCE OF OVARIES

If, as it seems, the diffuse network of preganglionic pathways to the ovaries provides a route for the mediation of impulses which begin as "emotional" disturbances, the mechanisms involved seem to overlie another set of factors, extra-ovarian in character, which also conduce to uterine periodicity, and presumably could also be thrown out of gear. This is indicated by the fact, observed in monkeys (Zuckerman 1937a, 1941a) and women (Reynolds et al. 1940, Di Paola and Del Castillo 1942), that uterine bleeding will occur periodically in the absence of the ovaries in subjects maintained on a constant threshold dose of œstrogen. In similar conditions spayed rats also demonstrate recurrent periods of œstrus (Del Castillo and Calatroni 1930, Zuckerman 1938b), and the results of experiments suggest that, though the pituitary gland is neither directly nor indirectly involved in this extragonadal control, the suprarenal cortex is (Bourne and Zuckerman 1940). The exact manner in which the suprarenal cortex exercises its effects is unknown, but the more obvious of possible mechanisms are three:

1. The cyclical activity of the suprarenals may lead to the cyclical hydration and dehydration of the reproductive tract, and such changes may alter the responsiveness of the organs to œstrogenic stimulation.

2. The suprarenal cortex may produce a subliminal amount of œstrogenic hormone, the amount produced varying cyclically and becoming greater at times of œstrus. The total effective œstrogen acting on the reproductive tract of a spayed rat injected daily with threshold doses of œstrogen would thus be the introduced œstrogen supplemented by the œstrogen produced by the suprarenals. Œstrous changes in the accessory organs would only occur when the suprarenal cycle of œstrogen production was at its peak.

3. The suprarenal cortex may cyclically produce androgenic and/or progestational hormone, and this endogenous hormone may neutralise the effect of the introduced hormone during the dioestrous phase of the artificial threshold cycle. Alternatively, such hormone may be produced continuously but in amounts which vary cyclically.

Whichever of these mechanisms is the determining one, it is clear that it represents a possible extra-ovarian factor in the occurrence of menstrual irregularity, assuming of course that the suprarenal cortex plays the same part in man as it appears to do in the rat.

MECHANISM OF MENSTRUATION

Repair, proliferation, and secretory differentiation of the endometrium during the menstrual cycle are associated with changes in the water content of the uterine mucosa, and the œdematous changes observed in the normal cycle can be reproduced by administering œstrogen and progestogen in the absence of the ovaries. Conversely, Van Dyke and Ch'en (1936) have shown that in monkeys the onset of menstruation is associated with dehydration of the uterus. It therefore seems possible that the breakdown of the endometrium at the end of a cycle is at least partly due to the abrupt resorption of water which has gradually accumulated in the stroma under the influence of previous sex-hormone stimulation and has acted as a fluid scaffolding for the glands and blood-vessels of the proliferated endometrium (Zuckerman 1939). Markee's (1940, 1947) well-known hypothesis about the mechanism of menstruation, which is based on observations of the cyclical changes undergone by fragments of monkey endometrium transplanted into the anterior chamber of the eyeball, combines this idea with Daron's (1936) picture of the cyclical differentiation of the blood-vessels of the endometrium. The endometrial vessels are said to be of two kinds: straight arteries which supply only the basal third of the mucosa; and spiral vessels which extend almost to the epithelium of the cavum uteri, where they end in a leash of arterioles. When the menstrual process has ended, the basal third and part of the middle zone (spongiosum) of the endometrium remain, together with the basal straight vessels and the deeper parts of the coiled arteries of the previous cycle's endometrium. The latter, and according to Markee some straight vessels as well, grow into the regenerating endometrium at a linear rate greater than that at which the mucosa increases in thickness. Either for this mechanical reason, as Markee suggests, or because they are "determined" that way in the embryological sense, the vessels are redifferentiated as the spiral arteries of the endometrium.

Markee's direct observations in the monkey show that, a few days before menstruation starts, the endometrium rapidly decreases in thickness, a change which is clearly due to reabsorption of tissue fluid. This observation is in keeping with Bartelmez's (1933) and several earlier histological studies of the human uterus. The flow of blood through the strata spongiosum and compactum decreases as fluid is resorbed owing, according to Markee, to compression and a resultant increased coiling of the spiral vessels. Vascular stasis leads to necrosis and "weakening" of the vessels and, for the twenty-four hours before bleeding begins, is intensified by vasoconstriction. This, Markee suggests, may be due to some substance similar to the "necrosin" of Menkin (1944) that is liberated by the degenerating endometrial tissue. The constriction does not affect all vessels at the same time, and bleeding occurs during transitory periods of vasodilation. The disorganisation of the endometrium proceeds apace, and pieces become detached from the main structure, the process, according to Markee, being akin to crumbling.

This picture of the menstrual process hinges on the presence of the spiral endometrial vessels and on the effects of their mechanical compression. Though it seems to fit many of the facts it does not explain all. Its main shortcoming is that menstruation may occur

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in the absence of coiled arteries. Kaiser (1947a and b) has made a special study of this point and has shown that no spiral endometrial vessels occur in any of three species of menstruating South American monkeys (*Cebus, Alouata palliata,* and *Ateles geoffroyi*). The endometrial vascular pattern comprises straight arteries and arterioles which branch and break up into capillaries at all levels of the endometrium. Kaiser has also observed that the spiral vessels may be very poorly developed in the gibbon (the smallest species of ape), and on the basis of a close study of the uterus of the rhesus monkey he questions whether uterine bleeding without ovulation can be explained by the hypothesis of the spiral arteries. His first observation (1947a) on this point is that the coiled sections of the endometrial arterioles are restricted to the basal zone of the endometrium, and thus not to the levels most affected by the menstrual process. Nevertheless he suggests that the vessels may, as is implied in the hypothesis associated with Markee's name, help to regulate the blood-loss that occurs in menstruation. His most recent observation (Kaiser 1948a), however, seems to cast doubt even on this view, for he has shown that normal œstrogen-withdrawal bleeding can occur in spayed rhesus monkeys in spite of virtually the complete absence of coiled endometrial vessels. Kaiser's (1948b) own suggestion is that the main functional significance of these vessels is in the process of implantation of the embryo.

A further shortcoming of the spiral-artery hypothesis of menstruation is that it does not appear certain now that the withdrawal of extracellular water from the endometrial stroma is a prerequisite to bleeding. The implication of the hypothesis is that water is deposited as a result of œstrogen and progesterone stimulation, and that it is resorbed during a phase of depressed or minimal sex-hormone action which begins a few days before the onset of bleeding. This may well represent the usual course of events. As already observed, however, cyclical uterine bleeding will occur in a spayed rhesus monkey maintained on a constant threshold dose of œstrogen, and similar bleeding has been reported in women. Even if the uterus in these circumstances is being additionally stimulated by endogenous œstrogen produced by the suprarenals, and in amounts which vary with the cycle, it is highly improbable that the effective stimulation of the uterus varies sufficiently to have much effect on the degree of hydration of the uterine mucosa.

EFFECT OF PROGESTERONE ON ENDOMETRIUM

It has recently been observed that uterine bleeding can occur as a result of treatment with progesterone alone. Zondek and Rozin (1938) were the first to make this observation; but, since their patients were not ovariectomised, it is impossible to exclude a possible interaction of endogenous œstrogen with the injected progesterone. Hartman and Speert (1941) have, however, shown that progesterone unassociated with any other treatment will induce uterine bleeding as a withdrawal phenomenon in spayed rhesus monkeys. This observation has been confirmed and extended by Eckstein (personal note), who has induced progesterone-withdrawal bleeding in animals kept without any treatment for 3–6 months, and whose uteri were therefore fully involuted and unprimed before treatment was begun. Krohn (personal note), using intact amenorrhœic monkeys, has observed that if a second 5-day course of progesterone treatment is started immediately after a previous progesterone-withdrawal bleeding, uterine bleeding will occur again after a latent period of 3–5 days. As many as five immediately successive phases of uterine bleeding have been induced in this way.

These observations need to be followed further to discover whether the bleeding which occurs is associated with vascular changes of the kind that have been referred to above. Hartman and Speert have noted its occurrence in the almost complete absence of coiled arteries.

HORMONAL CONTROL OF MENSTRUAL CYCLE

These recent findings make it necessary to modify slightly an interpretation of the hormonal control of the cycle put forward on the basis of an extensive series of experiments on spayed rhesus monkeys (Zuckerman 1937a, b, and c). According to this interpretation the underlying hormonal mechanism is a wave of œstrogenic stimulation, which is more intense in the first than the second half of the cycle. With the possible exception of the secretions of the suprarenal cortex, this is the only hormonal influence to which the uterus is subjected in menstrual cycles without ovulation. When ovulation occurs, a phase of progestational stimulation is superimposed upon the lowered œstrogenic stimulus of the second half of the cycle, and uterine bleeding occurs when the progestational and œstrogenic stimuli are cut off or reduced to a subliminal level.

In this interpretation the only controlling function attributed to the progestational stimulus, as distinct from its morphogenetic effects on the uterus, was that of a brake on, and a neutraliser of, the œstrogenic stimulus. The more recent information about the effects of progesterone makes it necessary to regard the necrosis of the endometrium as a direct effect of the withdrawal of both the œstrogenic and the progestational stimulus.

CONCLUSION

In spite of a vast amount of experimental inquiry into the factors that control periodic uterine bleeding, the limits of action and the interaction of the different sterol hormones on the primate uterus are still far from understood. For example, it is well established that an expected uterine bleeding can be inhibited either with œstrogen or progesterone, or cortical hormone, or androgen; what is not known is whether the mechanism of their action is identical. Similarly, little is understood about the processes which underlie the mutual cancellation of the specific effects of the sex-hormones; for example, the neutralisation of progestational by œstrogenic stimulation and vice versa. Some of the quantitative aspects of these interactions have been elucidated, but the site of the reaction has still to be demonstrated.

In all this work there has been a slight tendency to regard the uterus as purely a passive reacting organ. The occurrence of "threshold" menstrual cycles in spayed monkeys suggests that it may have an underlying rhythm of its own. This is one of the possible explanations that have been suggested for the phenomenon, and it still needs to be investigated. Another piece of evidence which suggests that the uterus may not be a purely passive reacting organ is the fact that the smallest single dose of œstrogen effective in producing uterine bleeding is lower when injections are begun at an effective high level and then decreased than when the injections are increased from an ineffective low level (Zuckerman 1941b). Related to this observation is the finding that the uterus is much more responsive to œstrogenic stimulation immediately after uterine bleeding begins than when it has returned to the inactive state characteristic of ovariectomy. This clearly suggests that it is not just the level of sex-hormone concentration in the body fluids which determines the responsiveness and behaviour of the uterus. Whether or not the uterus, as Smith and Smith (1947) suggest, also produces a "menstrual toxin" which is responsible for the vascular damage that leads to uterine bleeding—the "necrosin" referred to by Markee—still remains to be proved. This suggestion is of interest in the light of the occurrence of "threshold menstrual cycles" in spayed women and monkeys, for it suggests that a primary uterine factor

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helps to control the periodicity of the menstrual cycle. Experiments have, however, shown that the corresponding threshold œstrous cycle in rats can be explained without recourse to any such assumption (Bourne and Zuckerman 1940).

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"... Everyone will surely agree that unanimity of opinion is not one of the characteristics of the world today. ... On one point however, there is nearly unanimous agreement; hardly anyone will dissent from the statement that keeping people well is and should be a matter of prime importance. A historian a thousand years hence examining the records of our culture will conclude perhaps that the goal of physical well-being was one of the unifying forces of the twentieth century. This historian might well find that the striving for a long and healthy life played a predominant rôle, particularly among those people whose presuppositions flowed from the Judaic-Christian tradition. ... It is worth emphasizing this striking feature of our cultural pattern both because it is a novel element in recorded history and because far too little is heard about it in current discussion of the grim period in which we live. Recent and present barbarism of police states and the brutalities of war occupy the thoughts of sensitive men and women to so large a degree that we take for granted a civilization in which the goal of physical well-being for all peoples is implicit in a vast range of our activities."—JAMES BRYANT CONANT in a foreword to *Public Health in the World Today*. Cambridge, Mass., and London, 1949.

RETURN OF TONE IN BLOOD-VESSELS OF THE UPPER LIMB AFTER SYMPATHECTOMY

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THE recovery of tone in human blood-vessels after sympathectomy was first described by Lewis and Landis (1929), who noted that the skin became pale soon after the operation, and that the pulsations in the digital arteries gradually became impalpable. The phenomenon has been investigated in the fingers (Freeman et al. 1934) by the skin-temperature method, and in the forearm (Grant and Pearson 1938, Wilkins and Eichna 1941, Grayson 1948) and fingers (Grayson 1948) by plethysmography.

The experiments described below are, we believe, the first attempt to record the blood-flow in the hand with the plethysmograph daily for a fortnight or so after sympathectomy in a large number of hands.

EXPERIMENTAL

The procedure was planned to cause the least possible disturbance to the patient.

The hand was kept out of the bed-clothes for at least half an hour before the beginning of each test. The patient usually lay with the head and back supported by pillows but sometimes flat. A bedside table was placed under the elbow. The forearm was held upright, and the height of the table was

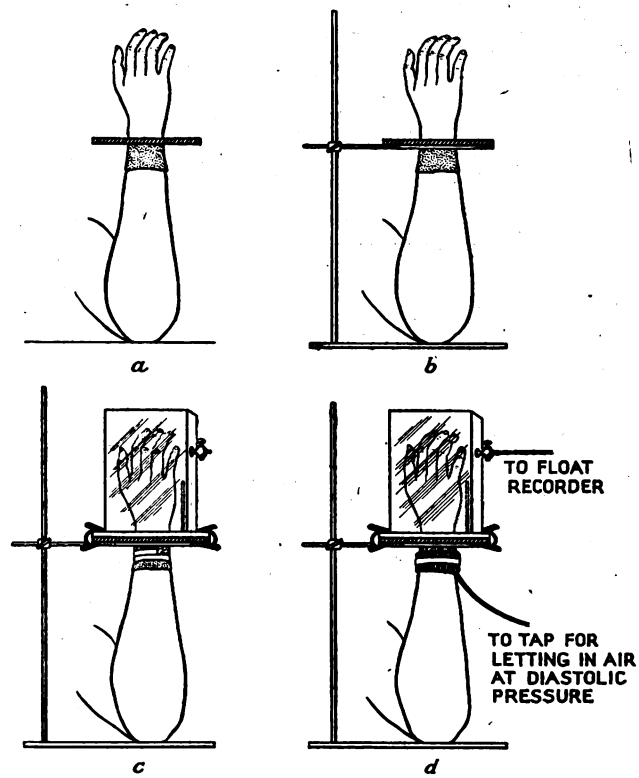

Fig. 1.—A simple hand plethysmograph (see text): *a*, rubber diaphragm and cuff applied to wrist; *b*, brass ring with large hole passed over hand and fixed at level of wrist; *c*, tape fixed round cuff and perspex box plethysmograph put on; *d*, tubing from airtight plethysmograph connected to recorder, and pneumatic collecting cuff fastened round wrist with tape.

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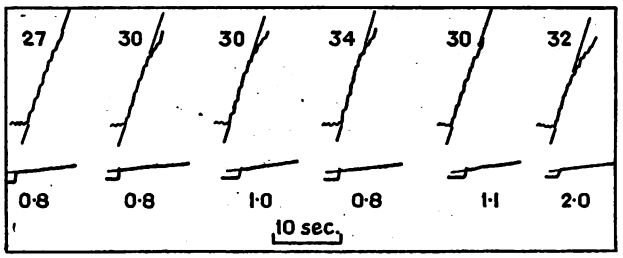

Fig. 2—Tracings of arterial inflows into hands on day after right hand had been sympathectomised.

adjusted, so that the hand was above the heart level to empty the veins. A rubber diaphragm and cuff that fitted the wrist nicely but not at all tightly was slipped over the hand (fig. 1) (see Barcroft and Edholm 1943). The veins of the back of the hand were examined for congestion; if it was present, another diaphragm with larger hole and cuff was substituted. To prevent leakage of air under the cuff it was lightly bound to the wrist with a couple of turns of insulating tape of non-vulcanised rubber, care being taken to avoid venous congestion. A brass ring was then passed over the hand and diaphragm to wrist level and clamped to a retort stand on the bedside table. The 'Perspex' plethysmograph was put on and clamped to the ring with four paper-clips. The $1^1/_2$ in.-wide collecting cuff was put on, leaving a space of about $^1/_2$ in. below the brass disc, and bound on with tape; the veins were examined through the perspex to make sure that it was not too tight. The tubing from the plethysmograph and collecting cuff was connected to the recording apparatus (Barcroft and Edholm 1943), which was on a movable trolley cupboard placed beside the bed.

To record the blood-flow a tap was turned and the collecting cuff round the wrist was inflated with air at a pressure of about 70 mm. Hg. This did not hinder the arterial inflow but stopped the venous outflow for a short time till the veins became congested. The immediate effect, therefore, was that the hand began to swell, and the rate of swelling was recorded on moving paper by the displacement of air from the plethysmograph into a float recorder. The more rapid the blood-flow the steeper was the upward slope of the record (fig. 2). After the hand had been swelling for a few seconds the tap was turned back, the collecting cuff deflated, and the blood allowed to escape from the veins. From six to ten records of the blood-flow were made at intervals of about $^1/_2$–1 min. The temperature of the air in the plethysmograph was taken. The blood-flow in the other hand was next recorded. The patient's temperature and the temperature of the ward were noted.

The apparatus was then calibrated; the volume of each hand was measured by water displacement. The rate of the blood-flow was calculated for each record and expressed in ml. per 100 c.cm. of hand per min. Those for each hand were averaged.

If possible, one or two tests were done before operation. The first postoperative test was done about six hours after operation. The procedure could be carried out without any assistance from the patient.

In some cases the temperature of the skin of the fingers and thumb just proximal to the nail was measured with a thermocouple before attaching the plethysmograph (Lewis 1927).

Curved inflows were obtained in a few hands in spite of the precautions to prevent venous congestion; these hands were considered unsuitable for plethysmography and were not tested after operation.

CONDITION OF BLOOD-VESSELS IN HANDS

Experiments were made on 14 sympathectomised hands (see table). The blood-vessels in 5 hands were presumably normal, since they had been sympathectomised for excessive sweating (hyperidrosis). The other 9 hands had been sympathectomised for vascular disease (Raynaud's disease 6, chilblains 2, acrocyanosis 1); in some of them structural changes had occurred in the vessels, with the result that they could not dilate so widely as normal vessels.

RESULTS

The results of the whole series of experiments are shown in figs. 3–10. In every hand tested the most rapid flow was recorded either immediately after sympathectomy or on the following day. The flows through the hands with normal vessels (figs. 3–5), which could dilate fully when the sympathetic tone was released, were generally greater than those through the hands with diseased vessels (figs. 6–10). The results show that the blood-flow in all hands decreased rapidly during the remainder of the first week and more slowly during the second.

CONDITION OF BLOOD-VESSELS IN 14 SYMPATHECTOMISED HANDS

Case no.	Sex	Age (yr.)	Diagnosis and length of history	Vascular signs	Operation	
					Right	Left
1 (fig. 3)	F	35	Hyperidrosis, 6 mos.	Nil	Thoracic trunk section (Telford) and division of cervical cord below middle cervical ganglion (to cause bilateral Horner's syndrome)	Cervicothoracic ganglionectomy (stellate T2 and T3)
2 (fig. 4)	M	39	Hyperidrosis, 20 years; dermatitis of axilla, $1^1/_2$ yr.	Nil	Telford's operation; Horner's syndrome resulted; T1 white ramus presumably divided	Cervicothoracic ganglionectomy (stellate T2 and T3)
3 (fig. 5)	M	46	Paroxysmal hyperidrosis of left side of head associated with headaches, 4 yr.	Nil	—	Cervicothoracic ganglionectomy (stellate and T2)
4 (fig. 6)	M	34	Raynaud's disease, 6 yr.	Superficial ulceration round left finger-nails	Cervicothoracic ganglionectomy (stellate T2 and T3)	Cervicothoracic ganglionectomy (stellate T2 and T3)
5 (fig. 7)	F	42	Acrocyanosis of left hand, 2 yr.	Superficial ulceration of fingers and thumb; separation of two nails	—	Thoracic trunk section below T3 (Smithwick)
6 (fig. 8)	F	20	Excessive chilblains of both hands	Nil	Thoracic trunk section (Telford)	Thoracic trunk section (Telford) produced Horner's syndrome
7 (fig. 9)	M	20	Raynaud's disease, $1^1/_2$ yr.	Superficial ulceration of finger-tips of both hands	Thoracic trunk section (Telford) produced partial Horner's syndrome	Cervicothoracic ganglionectomy (stellate T2 and T3)
8 (fig. 10)	F	35	Raynaud's disease, 2 yr.	Superficial ulceration of finger-tips of both hands	Thoracic trunk section (Smethwick)	Thoracic trunk section (Smethwick)

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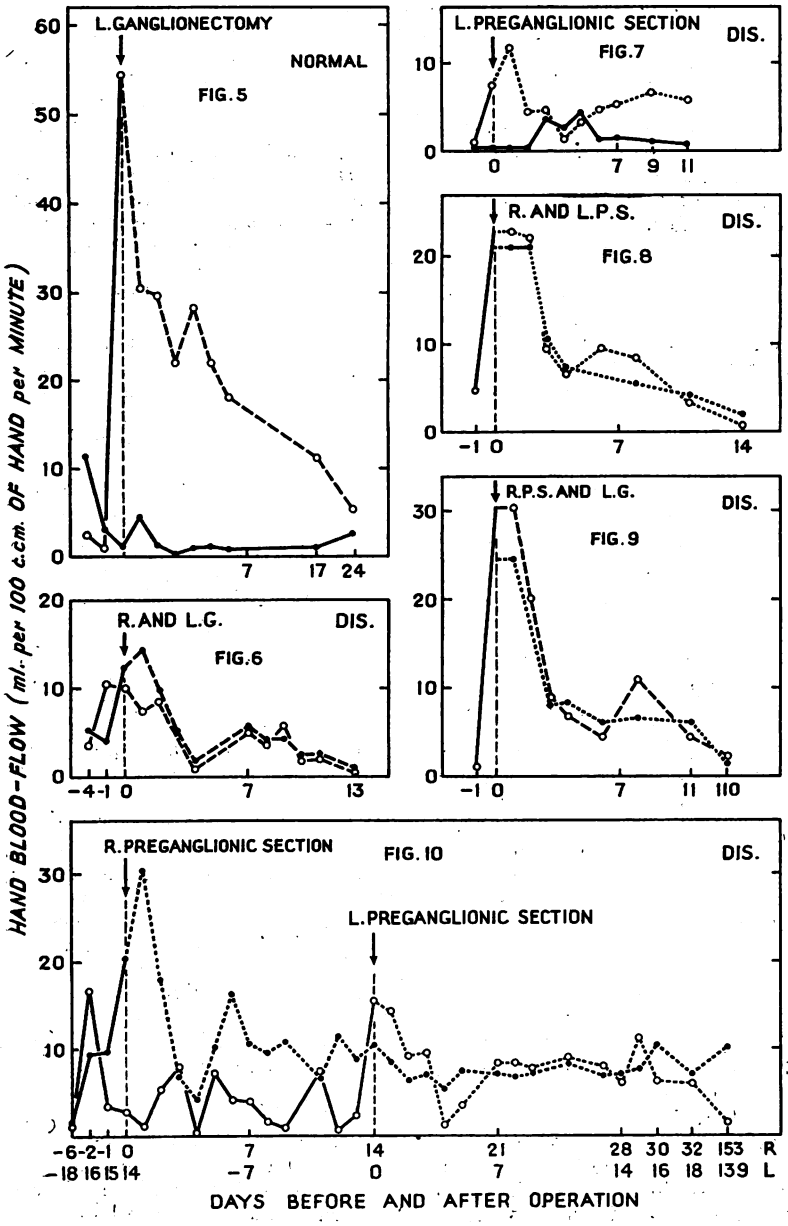
Average blood-flow in hand (ml. per 100 c.cm. of hand per min.)

	After operation	1 week after	2 weeks after
5 hands with normal blood-vessels.. ..	46 (1) ..	11 (1/4) ..	6 (1/8)
9 hands with vascular disease	20 (1) ..	7 (1/3) ..	3 (1/7)

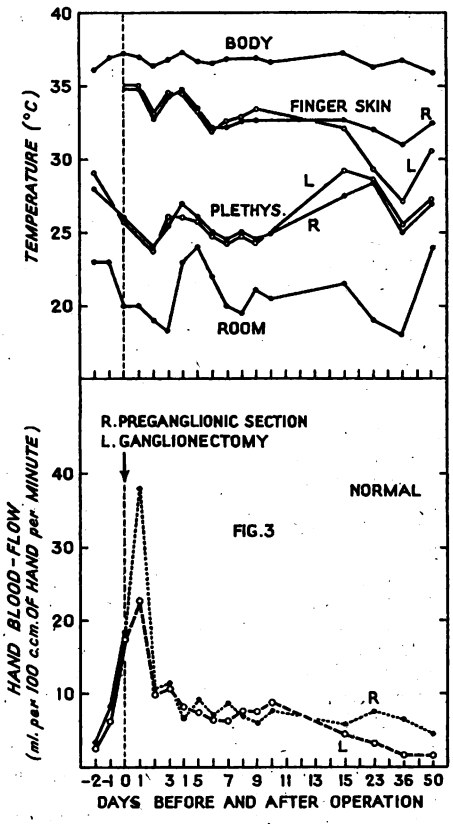
It will be seen that the average blood-flow in the hands with normal vessels had decreased to a quarter of its postoperative rate in a week, and to an eighth in a fortnight, and that tone returned to the diseased vessels at much the same rate as it did to the normal ones.

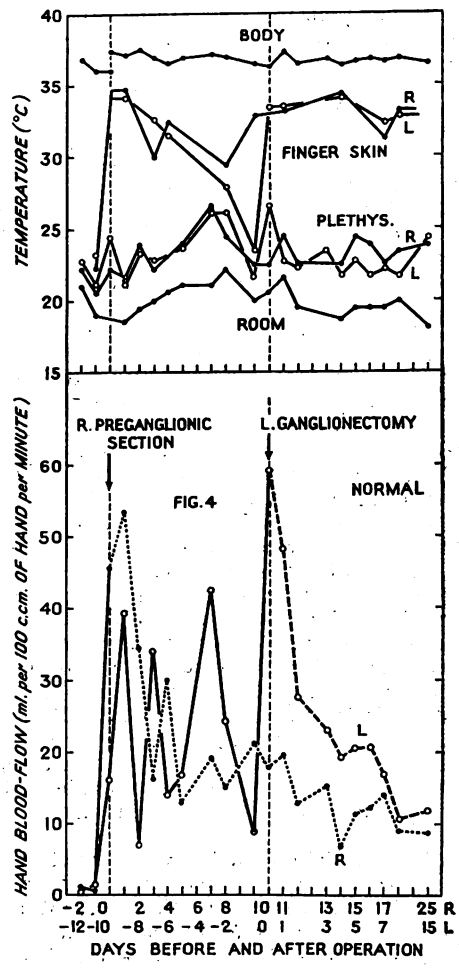
Reliability of Results

A possible explanation of the very large postoperative blood-flow through the hand is that it was caused by vasodilator substances released by the trauma of the operation or by the postoperative pyrexia (averaging 0·5°C for forty-eight hours). That this was not the explanation was proved as follows. In six operations



Figs. 3-10—Blood-flows in hands with normal and with diseased blood-vessels: continuous line, preoperative blood-flow; broken line, blood-flow after ganglionectomy; dotted line, blood-flow after preganglionic section; right hand solid, left hand open, circles.





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only one hand was sympathectomised; the other one served as a control. No dilatation occurred in 5 of these 6 control hands either immediately after the operation or on the following day. This proved that the vasodilatation in the sympathectomised hands was due to the sympathectomy. (The operations which were not followed by any vasodilatation in the control hand are those relating to fig. 4, second operation; fig. 5; fig. 7; fig. 10, both operations. The operation which was followed by a dilatation in the control hand was that related to fig. 3, first operation.)

It will be remembered that, to simplify the technique, the plethysmograph was filled with air instead of (as is usual) water maintained at a constant temperature. The question arose whether the behaviour of the blood-flow after sympathectomy could have been due to the influence of changes in temperature of the air surrounding the hand rather than to fundamental processes taking place in the blood-vessels. However, fig. 3 shows the complete absence of any apparent relation between the temperature of the air in the plethysmograph and the rate of the blood-flow in the hand. Further, fig. 3 shows that the temperature of the air in the plethysmograph generally followed day-to-day changes in the temperature of the air in the ward, only at a slightly higher level. There was no similarity in the day-to-day changes in the plethysmograph temperature after the operations, since these were all done on different days; on the other hand, there was a considerable similarity in the behaviour of the blood-flow after sympathectomy in all cases (figs. 3–10)—this must therefore have been due to some cause other than variations in the temperature of the air surrounding the hand.

A test was done a few weeks after operation to see if the sympathectomy had been complete (Barcroft and Hamilton 1948). The results showed that it was complete in 11 hands (heating ratios 0·7–1·6) and incomplete in 2 hands (fig. 9, left hand ratio 2·6; fig. 10, left hand 1 ratio 2·8). One hand could not be tested (fig. 7).

DISCUSSION

The experiments described above show conclusively that the rapid blood-flow in the freshly sympathectomised hand lasts no longer than forty-eight hours; by the end of the first week it has declined to about a quarter of its postoperative rate, and after two weeks it has decreased to about an eighth.

The observed rapid decline in the rate of the blood-flow after sympathectomy is in accordance with the disappearance of pulsation in the digital arteries as found by Lewis and Landis (1929), with more recent clinical experience (Grimson 1946, White 1948), and with previous experimental work on other parts of the body (Grant and Pearson 1938, Wilkins and Eichna 1941, Grayson 1948).

Dale and Richards (1918) and McDowall et al. (1938) thought that recovery of tone after sympathectomy took place in the capillaries. Lewis and Landis (1929) were the first to emphasise the participation of the small arteries. It seems likely that the arteriovenous anastomoses must recover their tone too. Grant and Bland (1929) have shown that arteriovenous anastomoses are controlled by the sympathetic system in the rabbit, and this is probably so in man. If so, they must be widely dilated after sympathectomy, and the blood-flow through them must be considerable. It is hardly likely that the flow could return to about the preoperative level unless the arteriovenous anastomoses regained their tone.

At first sight the observation that the blood-flow in the diseased vessels soon returned to near the preoperative rate seems to throw doubt on the value of sympathectomy as a therapeutic measure for vascular disease of the fingers. However, there is conclusive evidence of the excellence of the clinical results (White 1948, Barcroft and Hamilton 1948, Kinmonth 1949).

From the clinical point of view the recovery of tone in the fingers and toes, the parts commonly affected by vascular disease, is of more interest than the recovery of tone in the entire hands and feet. Further work is needed on the amount of recovery of tone in the fingers as compared with that in the whole hand, and on the recovery of tone in the vessels of the toes and feet.

The reason why blood-vessels recover their tone after sympathectomy is still unexplained though it has been much discussed (Dale and Richards 1918, Grant 1935, Freeman et al. 1934, Cannon 1937, McDowall et al. 1938).

Figs. 3–10 show the postoperative blood-flows after ganglionectomy and after preganglionic section. This is of considerable surgical importance. The early human sympathectomies were ganglionectomies—i.e., mainly postganglionic. Later it seemed that this operation might be open to the objection that degeneration of the postganglionic fibres would sensitise the nerve-endings of the muscular coat to circulating vasoconstrictor substances. Elliot (1905) had observed this in the cat, Grant (1935) in the rabbit, and Freeman et al. (1934) in man. Figs. 3–10, however, show that the behaviour of the blood-flow after ganglionectomy appears to have been just the same as that after preganglionic section. The long-term clinical results of both operations have been shown to be similar (Kinmonth 1949). White (1948) concludes that the problem of sensitisation of denervated smooth muscle to adrenaline has been found to have less clinical importance in man than was at first suggested by experiments on animals. Further work on this important question is in progress.

White and Smithwick (1941) described a curious phenomenon in some of their cases 2–6 days after operation—i.e., a transient drop in skin temperature and in skin resistance, together with colour changes and coolness of the extremity lasting 36–48 hours. This phenomenon was seen in the results obtained on 5 of the 14 hands which we investigated, all of them hands with diseased vessels (figs. 6, 7, and 10). In one case the constriction was so strong that it caused a vasospastic attack of blue fingers (fig. 6). Govaerts (1936) reported it too and thought it was caused by the spontaneous discharge of nerve impulses from decentralised ganglion cells, since blocking of the ulnar nerve was often followed by a rise of 10°F in the temperature of the skin of the finger.

A few words must be said about the average finger temperatures shown in figs. 3 and 4. Obviously they are not at all closely related to the blood-flow in the hands. Nor does it follow that they should be, because the skin temperatures depend on the blood-flow in the finger-tips, whereas the blood-flow through the hand is the sum of the flows through each of its different parts. Likewise it is well known that at high blood-flows skin temperatures are unreliable (Lewis 1927). Nevertheless, recovery of tone after sympathectomy must have taken place to a large extent in the vessels of the fingers though it is not apparent from the results of the skin-temperature readings. Further work on the blood-flow through the fingers after sympathectomy is needed with a more reliable method—as, for example, the Goetz (1943) finger plethysmograph.

SUMMARY

A simple plethysmographic method is described for determining the rate of the blood-flow in the hand.

The blood-flow in 5 hands with normal vessels and 9 hands with abnormal ones was determined daily for about a fortnight after sympathectomy.

The average postoperative blood-flow in the 5 hands with normal vessels was 46 ml. per 100 c.cm. of hand per

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minute. After the first week it had decreased to 11 ml. (a quarter of the average maximal postoperative rate), and after two weeks to 6 ml. (an eighth).

The average postoperative blood-flow in the 9 hands with diseased vessels was 20 ml. per 100 c.cm. of hand per minute. After the first week it had decreased to 7 ml. (a third), and after two weeks to 3 ml. (a seventh).

Recovery of tone occurs in the arteries, arteriovenous anastomoses, and capillaries.

The rate of recovery of tone after ganglionectomy was similar to that after preganglionic section.

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TEMPORAL ARTERITIS

REPORT OF SEVEN CASES

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TEMPORAL arteritis is undoubtedly rare. It was first established as a nosological entity by Horton and Magath (1937); but Hutchinson (1890) was the first to describe it—in a patient who complained of tenderness of the temples when a hat was worn. Also, a case was recorded by Schmidt (1930). Cooke et al. (1946) reviewed all the previously published cases, adding 7 of their own, and Harrison (1948) discussed its ætiology and pathology.

Of the 7 cases described here, case 1 is of special interest because of the presence of pericarditis, which was confirmed electrocardiographically. This complication of temporal arteritis has not been recorded before.

CASE-RECORDS

Case 1.—A labourer, aged 63, whose previous health was excellent, began to have increasingly severe headaches, which his doctor attributed to atypical trigeminal neuralgia. On July 23, 1948, he was admitted to the Royal Sussex County Hospital under the care of Dr. W. A. Bourne.

The headaches, he said, had started slowly about a month previously; from the commencement he had noticed that his right temple was sore and it was becoming sorer. The pain was described as very severe, stabbing, and shooting from the right temple to the nape, to the upper jaw, and even to the neck and down over the clavicle. The patient also complained of a tight feeling round his neck, worse on the right side. When he ate, his jaw was tender, and pain "shot up into his forehead." At night he often woke up to find his pyjamas soaked with sweat.

On examination the patient was of slight build, weighing 6 st. 8 lb. He looked tired and haggard, and was obviously in pain. His temperature was 100°F and pulse-rate 90. The right superficial temporal artery stood out like a hard tortuous cord, and the overlying skin looked inflamed. On the left the artery appeared normal, but its walls were thickened as might be expected in a man of 63. The whole of the right occipital region was tender. The patient volunteered the statement that at times his head had been so sore he had been unable to rest it even against a pillow. No abnormality was detected in any of the other arteries. The cardiovascular system was normal to routine examination. Blood-pressure 118/65. Abdomen and lungs normal. Reflexes normal. A blood-count showed white cells 11,800 per c.mm. (polymorphs 68%, lymphocytes 30%, monocytes 2%). The corrected erythrocyte-sedimentation rate (E.S.R.) was 31 mm. in one hour (Westergren), and the hæmatocrit reading 34%. The Wassermann reaction was negative.

Progress.—On July 30 part of the right superficial temporal artery and part of the vein were removed for examination. Before this was done, various sedatives had been given without any real benefit, and there had been intermittent pyrexia, the evening temperature being about 100–101°F. Immediately after the specimens had been taken for biopsy, the pain began to lessen, but the fever continued. On Aug. 6 he was discharged still feverish and complaining of only slight discomfort.

Biopsy Findings.—The adventitia of the right superficial temporal artery was infiltrated with round cells, among which were a few eosinophils and giant-cells. There were areas of necrosis in the media. These appearances are typical of temporal arteritis.

Readmission.—On Sept. 20, six weeks after his discharge, the patient was readmitted because he still had headaches and a sudden pain had developed in the region of his sternum. He was obviously distressed; the headaches, he said, were still as bad as ever but had left his temple. The new pain in his chest was "sharp and crushing," but was fairly well localised to the substernal region. It was worse on deep breathing. There was no cyanosis. The pulse-rate was 110 and the temperature 100·4°F. On auscultating the heart a well-marked friction rub could be heard in the 4th intercostal space just to the left of the sternum. The blood-pressure was 110/70. No other abnormality was noted.

Treatment and Progress.—The patient was treated by absolute rest in bed and intramuscular penicillin 50,000 units six-hourly was given for five days. On the second day the temperature had fallen to 98·2°F and the pulse-rate to 80. The friction rub was heard plainly for the next four or five days and then disappeared.

Investigations.—The E.S.R. was 23 mm. in one hour on Sept. 23 and 21 mm. on Oct. 2 (corrected). A blood-count showed white cells 6800 per c.mm. (polymorphs 73%, lymphocytes 22%, eosinophils 2%, monocytes 3%). On radiography the heart and lungs appeared normal except for a healed tuberculous lesion at the right apex. An electrocardiogram showed rate 80, regular rhythm, P–R 0·16; R–T elevation in all leads, highest in lead II, with R–T distortion, suggesting pericarditis. Two weeks later (Oct. 6) the R–T elevation in lead I had disappeared, and in leads II, III, CR 4, and CR 7 it was much less, confirming the view that the changes were due to pericarditis.

The patient made an uninterrupted recovery and was discharged after three weeks to continue convalescence at home.

Follow-up.—On Nov. 19 he was re-examined. There were no symptoms. An electrocardiogram showed no abnormal changes. Radioscopy showed the heart and lungs normal except for the healed tuberculous lesion. On Dec. 29 the patient was still symptom-free. The biopsy wound was soundly healed. No pulsation could be felt in the right superficial temporal artery. The left superficial temporal artery seemed normal.

It is early yet to reflect on the ultimate prognosis of this patient. It is certain, however, that he must be kept under observation for a long time before he can be pronounced cured.

Case 2.—A frail old lady of 75, who complained that in the last two months she had become increasingly exhausted,

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was admitted on March 30, 1946. Severe headaches had started during this time and had been particularly severe in the temples.

On examination she was obviously in considerable pain. She looked feverish, and her temperature was 103°F. It remained at this level for the first four days after admission, and then fell to normal and remained below normal for the whole of her six months in hospital. The patient looked myxœdematous. The retinæ, heart, and lungs were normal. The blood-pressure was 135/85. The abdomen was normal. The lower limbs were spastic, but examination was complicated by advanced osteo-arthritis. The plantar responses were extensor. The superficial temporal arteries were very tender. The skin overlying them was red, and on palpation the arteries seemed thickened. The only other abnormal finding was a hypochromic anæmia—red cells 3,480,000 per c.mm.; Hb 50%; colour-index 0·8.

Biopsy Findings.—The lumen of part of one of the superficial temporal arteries was entirely occluded by a mass of cellular tissue consisting chiefly of fibroblasts. At the zone of junction of the media and the intima there were numerous giant-cells, many containing 20 or 30 nuclei. The picture was that of temporal arteritis.

Treatment and Progress.—The patient was given full doses of sulphadiazine. Her clinical condition gradually improved and headaches lessened. On discharge she was symptom-free.

Case 3.—A man, aged 75, had always been of peculiar temperament, and on two occasions had been treated by a psychiatrist. A few weeks before admission he again began to be aggressive, particularly towards his wife. He had previously had two similar episodes.

Six months before admission he began to have shooting occipitoparietal pain, which was not relieved by the ordinary analgesics. It persisted without intermission, increasing in intensity. Three weeks before admission it was predominantly on the right side, and examination at this time showed that the right pupil was smaller than the left and irregular in outline. The patient had no vision in the upper right temporal field, and in the next few days this visual defect extended until the whole of the vision in the right temporal field was lost. The right pupil did not respond to light. There was ptosis of the right eyelid. The superficial temporal arteries at this stage were firm and without pulsation. Three weeks after admission the patient's behaviour became normal.

Biopsy of the temporal artery relieved the pain considerably. The specimen showed the typical features of temporal arteritis.

Case 4.—A woman, aged 65, was washing-up in her scullery, when she suddenly felt a severe pain in the back of her neck. It spread to the scalp on both sides, her neck becoming so tender that she could not rest her head on a pillow. Three or four days later she noted that objects in the temporal field of vision of her right eye appeared blurred, and in the next few days the sight in her right eye was completely lost. At the same time vision in the left eye became increasingly "foggy" until she was blind. At this stage she was admitted to hospital.

On admission headache was very severe, with much tenderness over the occipital and superficial temporal arteries, which were not, however, noted as being thickened. The pupils were dilated and did not contract to light. There was no appreciation of light. The optic discs were swollen two dioptres and appeared greyish. Small hæmorrhages were seen along the course of the retinal vessels. The temperature showed an evening rise to 99·8°F. No other abnormality was noted.

Investigations.—Lumbar puncture revealed a clear fluid under a pressure of 140 mm. and containing protein 20 mg. per 100 ml., no excess of globulin, and 4 lymphocytes per c.mm. The Wassermann reaction of the blood and of the cerebrospinal fluid was negative.

Progress.—The patient began to improve four days after admission, and soon was pain-free. She was discharged three weeks after admission feeling well but completely blind. The optic discs were flat and greyish white.

Case 5.—A man, aged 71, came under observation in June, 1941, with four months' history of arthritis involving the fingers, wrists, knees, and ankles. Radiography showed hypertrophic arthritic changes in the affected joints. The corrected E.S.R. was 31 mm. in the first hour. The patient was treated with intramuscular 'Myocrisin' at weekly intervals, with rapid improvement of his symptoms. Five months later he had transient bronchitis.

In 1942 the joint condition recurred. The E.S.R. was now 37 mm. in the first hour. A further course of myocrisin led to considerable symptomatic improvement. Six months later the patient was seen again, complaining this time of headaches of a fortnight's duration; these had rapidly become so severe that, despite the use of aspirin, sleep was impossible because of the pain. The rheumatic condition appeared to have subsided, for there were no longer any symptoms referable to the joints. The function of the heart, lungs, and kidneys appeared normal. The patient was, however, losing weight and rapidly becoming weak.

On examination the superficial temporal arteries were prominent and tender on pressure. The skin over them was red. Pulsation could be felt in the vessels to the level of the zygomatic arch but no further. Careful search failed to disclose any other tender areas. The temperature rose to 99°F during the illness.

Investigations.—A blood-count showed red cells 4,420,000 per c.mm.; Hb 68%; colour-index 0·77; white cells 9760 per c.mm. (polymorphs 75%, lymphocytes 20%, monocytes 3%, eosinophils 1%, basophils 1%). A blood film showed some anisocytosis and hypochromia. E.S.R. (corrected) was 38 mm. in one hour. The Wassermann reaction of the blood was negative. The urine contained a few pus cells and many *Bact. coli* but no red cells, casts, or crystals. Radiography showed the lungs to be normal and the heart normal for a man of 71.

Treatment and Progress.—In September, two weeks after the onset of symptoms, Mr. Lloyd Williamson removed $1^1/_2$ in. of the left superficial temporal artery and vein under thiopentone anæsthesia. Next day the patient complained of pain on the right side of the head; this was relieved with two tablets of 'Veganin.' Two days later there was only slight pain on the left side which soon passed off, and in two more days he was discharged symptom-free. A fortnight later he was re-examined. He said that there had been no discomfort whatsoever. He could sleep right through the night where previously he "had been unable to sleep at all." The incision had soundly healed. On the right side the artery was prominent and hard to the touch.

Biopsy Findings.—There was well-marked periarteritis, with thrombosis of the vasa vasorum. The adventitial coat showed inflammatory and fibrotic changes. The media exhibited the most profound changes, being in part superseded by granulation tissue infiltrated by mononuclear cells. At the junction of the media and the adventitia a few giant-cells were seen. The internal elastic lamina was in some places disrupted or fragmented. The intima was greatly thickened, the greatest changes being in proportion to the areas of greatest damage to the media. There were no inflammatory cells within the intima. The lumen of the vessel was partially occluded by a thrombus which showed no changes to indicate recanalisation.

Case 6.—A woman, aged 82, was admitted in July, 1948. Six weeks previously she had begun to have pain in the left temple and a feeling of constriction in the throat. The pain was described as burning and at times very severe. Immediately before admission the pain became more generalised and seemed to involve the whole scalp—sometimes "the top of the head" or "the back of the neck"; but particularly she complained of a constant ache in both temples. Her face and neck began to swell, and palpation disclosed a very tender lump which was thought to be the site of a recent thrombosis of the jugular vein. This would have explained the swelling. Four or five days later the œdema had almost disappeared, and no tenderness or lump could be found in the neck. She was a rather thin old lady.

On admission she complained of moderately severe headache. Her temperature in the evenings was 99·6°F and showed a diurnal swing between 98 and 99·4°F. The superficial temporal vessels were thickened and tender for 2 or 3 in. suggesting thrombosis. Six days after admission the vision in the left eye began to deteriorate, objects appearing blurred. There was no particular field defect. The left pupil was dilated in comparison with the right pupil, and reacted only very sluggishly to light. Eight days later examination of the optic fundus disclosed considerable macular degeneration, with a greyish atrophic-looking disc. In the right fundus

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a recent hæmorrhage just internal to the macular was noted, but the degree, if any, of visual loss was not recorded.

A blood-count showed a microcytic hyperchromic anæmia: red cells 3,700,000 per c.mm., Hb 86%, colour-index 1·16, and white cells 8300 per c.mm. (eosinophils 4%).

Follow-up.—The case was followed up by Dr. R. W. Riddle, who reported three months later that the patient appeared in reasonably good health but was not so active as she had been three or four months earlier. She had had no further headaches. Her vision was reduced to appreciation of light only in the right eye; the left eye was blind.

Case 7.—A woman, aged 82, who had been a district nurse for over twenty years and had enjoyed remarkably good health, began towards the end of December, 1948, to have a diffuse ache across the back of the neck. The intensity and duration of this ache eventually forced her to remain in bed for most of the day. Three weeks later the pain involved the whole of the back of the skull. The slightest draught made it worse.

On examination at home the patient looked frail, sick, and tired. She was lying huddled up in the bed with her head almost completely enveloped in a scarf. Clinical examination was essentially negative. Her tongue was slightly furred. She had no fever. There was no tenderness of the occipital region, nor were neck movements restricted.

Her condition gradually deteriorated. She was eating almost nothing, and was too weak to leave her bed. The pain was growing worse, and the scalp had become so tender that even the pillows seemed too hard. Her tongue was furred; temperature 98·2°F; pulse-rate 68. The scalp over the occiput seemed diffusely sore, but it was impossible to locate any definite points of tenderness. The superficial temporal arteries were much thickened but probably no more than one would expect in a person aged 82; they pulsated freely. Nothing else abnormal was found. Phenobarbitone and tab. codeine. co. gave some relief.

Five weeks after the onset of the pain the skin over the temples became red and blotchy. The patient said that the pain had spread, being now particularly severe on each side of the forehead. Next day the course of the left superficial temporal artery was outlined by the red blush of the overlying skin. The artery was no longer pulsating, and was tender to pressure. The right superficial temporal artery also was tender, and the skin over its course and in its immediate neighbourhood was reddened. Pulsation, however, was free. A blood-count showed a low-grade anæmia; red cells 4,010,000 per c.mm., Hb 78%; white cells 6800 per c.mm. (polymorphs 85%, lymphocytes 21%, eosinophils 2%, and monocytes 2%).

Four days later a biopsy specimen of the left superficial temporal artery was taken by Mr. H. Park. Three days afterwards the pain was less and the patient began to take a more active interest in her surroundings. A fortnight later she got up, and now, three months after the onset of her symptoms, she is doing most of her housework. She is symptom-free, and clinical examination is negative except for the healed scar over the left temple. Pulsation can be felt in the right superficial temporal artery but not in the left. At no time were there any signs of visual disorder.

Biopsy Findings (Dr. L. R. Janes).—"Sections show the changes seen in giant-cell arteritis. There was thickening of the vessel wall, with reduction in the lumen. The normal medial structure was replaced by masses of cellular infiltrate consisting of fibroblasts, round and plasma cells and macrophages, including giant-cell forms both uni- and multinucleate. The elastic laminæ are largely destroyed; only fragments remain and there is fibroblastic proliferation in the intima and extending into the adventitia."

In view of the suggested therapeutic value of sectioning the artery, I attempted to obtain, by indirect and then by direct questioning, an idea of the relief, if any, derived from this minor operation. From my own personal observation there was no doubt that improvement followed this procedure, but the patient's statements led me to feel that the onset of the temporal inflammation might have marked the cessation of the active process. Nevertheless, when the previous cases are reviewed in the light of the day-to-day observations on this patient, it must be more than accidental that the relief following arterial section was so quick and pronounced. Admittedly, the occipital arteries were left intact; so a focus of trouble might still remain.

DISCUSSION

The cause of temporal arteritis is unknown, but its histology is well established. The adventitia and the media are affected most; the lumen may be occupied by a thrombus; giant-cells are nearly always present at the medial-adventitial junction; infiltration with round cells, mononuclears, small lymphocytes, and eosinophils is usual; and periarteritis is invariably present.

Gordon and Thurber (1946) argue that temporal arteritis and polyarteritis nodosa represent the same pathological process at two different stages. If sufficient care is taken, and areas of the artery slightly removed from the main focus of the disease are examined, the appearances he says, are almost identical. Harrison (1948) rejects this view; and certainly when a "typical" section of a diseased artery from a case of polyarteritis nodosa is laid beside a section from a case of temporal arteritis, the differences are apparent even to the uninitiated. It is well to recall that the range of response of any tissue to bacterial or other type of injury is limited, and occasional similarities cannot necessarily be taken to indicate identical ætiological factors.

Clinically, the prodromal phase consists of vague illness associated with neuritic pains, general malaise, a low-grade fever, sweating at night, and loss of weight. After an interval, which varies greatly from case to case, focal signs and symptoms appear. Severe headache characterises this phase, and seems to be due to spread of the disease to the superficial cranial arteries, particularly the superficial temporal arteries. The occipital arteries, however, are affected almost as often. The tired worn-out expression on the patient's face is almost characteristic. The pain does not respond to any of the usual sedatives except morphine. At this stage the affected superficial temporal artery resembles a cord; its course is tortuous; the overlying skin is often red; palpation may disclose tender nodules along the artery's length; and the artery is thickened, hard, and obviously tender. These features are pathognomonic.

Later the underlying disease may spread to other vessels, and it is now that blindness, the most serious complication, may develop; Kelbourne and Wolff (1946) put the incidence as high as 33%. Cerebral symptoms have also been recorded at this stage; and death due to profound cerebral disturbances may be a sequel to the involvement of the intracranial arteries.

Necropsies have shown that temporal arteritis is sometimes part of a generalised disease affecting other arteries in different parts of the body (Sproul 1942, Gilmour 1941). Consequently, in any case of temporal arteritis there may be signs and symptoms associated with individual arteries elsewhere. The pericarditis in case 1 may have been secondary to a coronary infarction, though the electrocardiographic changes were not characteristic. But is it not possible that one of the pericardial arteries was involved by the specific infective "agent," thus establishing a link between the development of this complication and the other arterial changes in the rest of the body?

If the disease is restricted to superficial cranial arteries, removal of a portion of each affected artery will abolish the pain, presumably by local sympathectomy.

SUMMARY

Seven cases of temporal arteritis are reported.

Three of the patients suffered severe permanent visual loss. One developed pericarditis, which has not been previously reported in association with temporal arteritis.

Temporal arteritis is sometimes part of a generalised disease affecting arteries elsewhere in the body.

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The pain of temporal arteritis can be abolished by resecting part of the artery.

Most of these patients were under the care of Dr. W. A. Bourne, physician to the Royal Sussex County Hospital. I am deeply indebted to him for permitting me to use his case-notes, and for his encouragement and advice.

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PARTITION CHROMATOGRAPHY ON PAPER

IDENTIFICATION OF REDUCING SUBSTANCES IN URINE

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IN clinical practice, reducing substances in urine are those which reduce alkaline copper or bismuth solutions—e.g., Fehling's, Benedict's, Barfoed's, and Nylander's. The ability to reduce alkaline copper solutions has been attributed to many substances found in normal or pathological urine. These include glucose, lactose, fructose, galactose, maltose, pentoses, creatinine, urates, homogentisic acid, salicyluric acid, ascorbic acid, chloroform, formaldehyde, the glucuronates of various drugs, and certain putrefactive bodies. The identification of these substances may prove difficult. It is usually attempted by one or more of the following procedures: (*a*) the formation and isolation of an osazone; (*b*) the measurement of optical rotation; (*c*) yeast fermentation; or (*d*) the reaction with certain alleged specific reagents—e.g., Fearon's methylamine test for lactose and Tollen's phloroglucinol test for pentoses. The difficulties of identification are enhanced when only traces of the reducing substance (about 0·2% or less) are present or when two or more reducing substances occur in the same urine.

Chromatographic separation followed by location of the reducing substances on filter-paper appears to be an accurate method of identifying these substances and one that may readily be performed in a clinical laboratory.

Partition chromatography on paper has been applied to the separation and identification of amino-acids in the hydrolysis products of proteins and polypeptides (Consden et al. 1944) and in urine and cerebrospinal fluid in certain pathological conditions (Dent 1946, 1948a and b). Partridge (1946, 1948a), Partridge and Westall (1948), and Flood et al. (1947, 1948) have applied the method to the separation of complex carbohydrate mixtures.

TABLE I—R_F VALUES OF REDUCING SUBSTANCES

Reducing substance	R_F values (solvent: *n*-butanol, acetic acid, water)		
	Partridge and Westall (1948) (corrected to 20°C.)	Descending chromatography (not corrected for temp.)	Ascending chromatography (not corrected for temp.)
Lactose	0·09	0·05	0·06
Maltose	0·11	0·07	0·06
d-Glucuronic acid	0·12	—	—
d-Galacturonic acid	0·14	—	—
d-Galactose	0·16	0·17	0·12
d-Glucose	0·18	0·19	0·15
l-Sorbose	0·20	—	—
Sodium urate	—	0·20	0·17
d-Arabinose	0·21	0·22	0·21
d-Fructose	0·23	0·22	0·19
Dehydroascorbic acid	0·27	—	—
d-Xylose	0·28	0·28	0·25
d-Ribose	0·31	0·29	—
d-Xyloketose	—	0·32	—
l-Ascorbic acid	0·38	0·45	0·42
Homogentisic acid	—	0·85	0·82
Urine containing salicylates	—	0·87	—

PRINCIPLE

The theory of partition chromatography has been dealt with elsewhere (Consden et al. 1944, Synge 1946). Briefly, when applied to urine, the method consists in spotting urine on to one end of a strip of filter-paper followed by continuous irrigation for 24–48 hours with a suitable solvent or solvent mixture. After evaporation of this solvent the paper is sprayed with an appropriate reagent or "developer" to locate the reducing substances, which should have been carried along the paper by the solvent. Under standard conditions the distance travelled by a reducing substance bears a constant relation to the distance travelled by the solvent and can be expressed (Consden et al. 1944) by a value R_F where

$$R_F = \frac{\text{Distance travelled by solute—e.g., reducing substance}}{\text{Distance travelled by advancing solvent front}}$$

The R_F value is a characteristic of a reducing substance for any particular solvent. It may be corrected (Partridge and Westall 1948) to a standard temperature (20°C) by reference to a standard sugar—e.g., glucose—and multiplication by a factor a_t, where

$$a_t = \frac{R_F \text{ value of glucose at } 20°C}{R_F \text{ value of glucose at } t°C}$$

The final identification of the reducing substance is determined by its R_F value (table I) and its colour reaction with appropriate spraying reagents (table II).

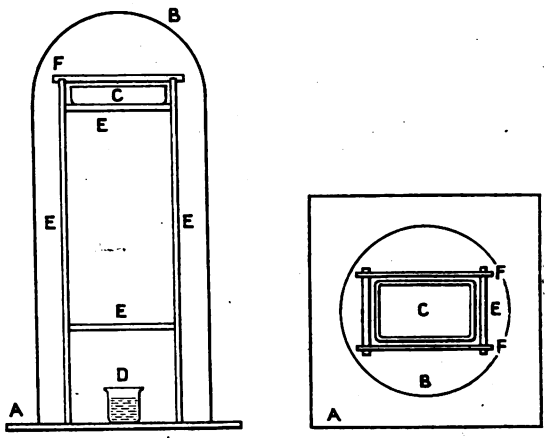

Fig. 1—Apparatus for descending chromatography: A, plate-glass base; B, bell-jar; C, trough containing solvent; D, beaker containing water saturated with solvent; E, wooden frame; and F, glass rod.

METHOD

Apparatus.—The chromatographic separation is done in a chamber which must be fairly airtight and of a sufficient length to accommodate a strip of filter-paper about 50 cm. long. The inside must be of a material which does not absorb the solvent vapour, or it must be rendered non-absorbable—e.g., by coating with paraffin wax. Consden et al. (1944) used a section of glazed earthenware drain-pipe, Dent (1946, 1948a and b) a coated wooden box, and Flood et al. (1948) a glass bell-jar. We have done most of the preliminary work for this paper in the apparatus illustrated in fig. 1. This consists of a tall bell-jar standing on a glass plate. Inside the bell-jar is a wax-coated wooden frame to support a glass or porcelain trough containing solvent, from which the filter-paper depends. Some such support must be provided for "descending" chromatography;

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TABLE II—COLOUR REACTIONS OF REDUCING SUBSTANCES WITH SPRAYING REAGENTS

Reducing substance	Spraying agent			
	Benzidine	Ammoniacal silver	Aniline hydrogen oxalate	Phloroglucinol
Lactose	Brown	Light brown or orange	Yellow	Nil
Maltose	Brown	Light brown	Nil or faint yellow	Nil
Galactose	Brown	Brown	Brown	Faint brown
Glucose	Brown	Brown	Brown	Nil
Fructose	Brown	Light brown	Faint yellow	Orange-brown
Pentoses	Chocolate-brown developing rapidly	Black or dark brown developing slowly in the cold	Bright-red spot developing rapidly	Greenish-blue developing slowly, increasing in intensity on standing
Ascorbic acid	Pale-brown spot	Black spot develops rapidly on warming or within a minute or so at room temperature	Nil or faint yellow	Nil or faint yellow
Urates	Nil or very faint brown	Black spot develops rapidly on warming or slowly at room temperature	Nil	Nil
Homogentisic acid	Nil	Intense black spot appears instantaneously on spraying	Nil	Nil
Urine containing salicylates	Nil	Brown spot only on heating at 100–105°C	Nil	Nil

but, if "ascending" chromatography is used (Williams and Kirby 1948), no such support is needed (fig. 2).

Solvents.—Various solvent mixtures have been suggested (Consden et al. 1944, Partridge and Westall 1948, Partridge 1948b). We prefer the *n*-butanol-acetic acid-water mixture of Partridge and Westall (1948) for the chromatography of reducing substances in urine. The mixture is prepared as follows:

40 ml. of *n*-butanol is mixed with 10 ml. of glacial acetic acid and 50 ml. of distilled water. The mixture is well shaken in a separating funnel, allowed to separate, and the lower aqueous layer is run into a beaker which is next stood inside the chromatographic apparatus. The butanol layer is run into the trough of the apparatus.

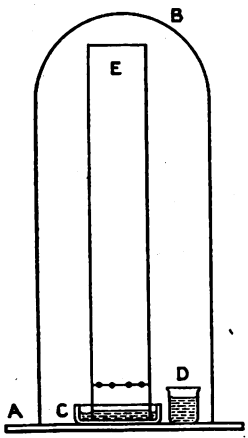

Fig. 2—Apparatus for ascending chromatography: A, plate-glass base; B, bell-jar; C, petri dish containing solvent; D, beaker containing water saturated with solvent; and E, filter-paper cylinder.

Spraying Reagents.—Several have been proposed. We found the following four of value for the present work:

(1) *Benzidine reagent.*—Benzidine AR 0·5 g.; glacial acetic acid 20 ml.; absolute ethanol 80 ml.

(2) *Phloroglucinol reagent.*—Phloroglucinol 0·2 g. is dissolved in 80 ml. of 90% ethanol, and the solution is made up to 100 ml. with 25% w/v trichloracetic-acid solution.

(3) *Ammoniacal silver nitrate* (Partridge and Westall 1948).—This is a mixture of equal parts of 0·1 *N* silver-nitrate solution and 5*N* ammonia solution, freshly prepared.

(4) *Aniline hydrogen oxalate reagent.*—*M*/10 oxalic-acid solution 100 ml.; aniline redistilled 0·9 ml. Shake until the aniline has dissolved.

Procedure.—The volume of urine taken for chromatography depends on the concentration of reducing substances present. The approximate concentration may be obtained by observing the resultant colour from the standard qualitative Benedict's test. Light green approximates 0·2%, yellowish-green 0·5%, a dirty orange-yellow 1·0%, and complete reduction 2% or more. The volume of urine taken is 5 µl. for 1% or more of reducing substance, 10 µl. for 0·2%–1·0%, and 20 µl. for less than 0·2%.

On a piece of Whatman no. 1 filter-paper, about 50 cm. long and of a width that can be accommodated in the trough, a pencil line is drawn parallel to one end at about 10 cm. from that end. Four aliquots of urine (volume as indicated above) together with 10 µl. of a control solution containing about 1% of dextrose and 1% of lactose are placed along the pencil line at 2 cm. intervals. This can be done conveniently with a Haldane 20 c.mm. (µl.) hæmoglobin pipette subdivided approximately into 5 and 10 c.mm. (µl.). If the urine contains less than 0·2% of reducing substance, the 20 µl. taken should be applied in two lots of 10 µl., the first spot being dried before the second is applied. The filter-paper is dried at room temperature or in a low-temperature oven. The apparatus illustrated in fig. 1 will accommodate two strips of filter-paper 46 × 13 cm., one on each side of the trough. Six spots can be placed on each of these strips, but the number of spots on any piece of paper is limited only by the capacity of the apparatus.

For descending chromatography the end of the filter-paper is held in the trough with a glass rod or a microscope slide. The line XY (fig. 3) hangs parallel to and about 1 cm. below the glass rod F (fig. 1). This latter glass rod should be about 3 cm. above the level of the solvent in the trough.

For ascending chromatography the filter-paper is fluted concertina-wise, or formed into a cylinder, and stood upright in the trough (fig. 2) with the pencil line near the base. It may be necessary to clip the ends of the paper together. In the apparatus shown in fig. 2 the solvent is contained in a 4-in. petri dish, which will also accommodate a strip of filter-paper 28 cm. wide. On this width 14 spots can be placed.

The trough is filled with the *n*-butanol, acetic acid, and water mixture, and the beaker containing the aqueous butanol-acetic acid phase is placed on the glass base. The solvent is allowed to flow for 24 hours or longer—i.e., until the solvent front has travelled 30 cm. or more. The filter-paper is next removed, blotted between filter-paper sheets to remove excess of solvent, the solvent front (X′Y′ fig. 3) is outlined in pencil, and finally the solvent is removed completely as in descending chromatography.

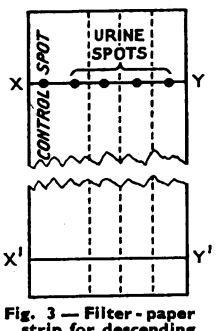

Fig. 3—Filter-paper strip for descending chromatography: dotted lines, where paper cut into strips after chromatography and drying; XY, line where drops of urine are applied; and X′Y′, solvent front.

The paper is now ready for spraying with the developing reagent. This may be done with an atomiser. Spraying should be carried out rapidly and evenly. Excess of reagent is removed by blotting between filter-paper, and the sprayed paper is next placed in an oven at 100–105°C for 10–20 min. according to the reagent used. Observations are made at intervals of 5 min.

We find it convenient, for routine purposes, to cut the filter-paper into

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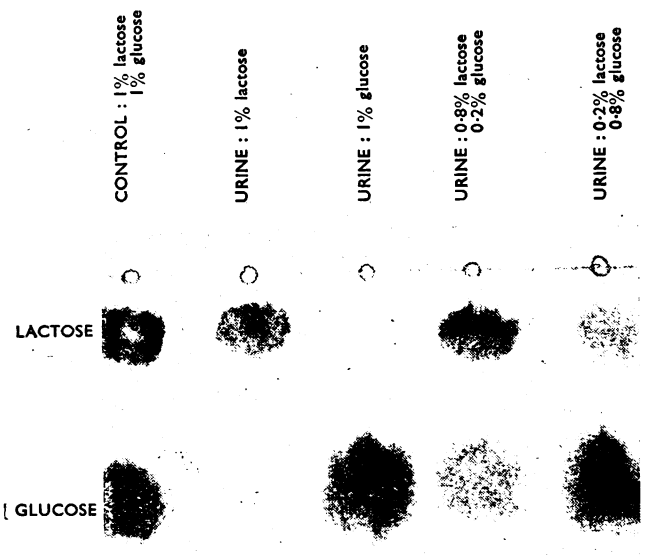
CONTROL : 1% lactose 1% glucose
URINE : 1% lactose
URINE : 1% glucose
URINE : 0·8% lactose 0·2% glucose
URINE : 0·2% lactose 0·8% glucose
LACTOSE
GLUCOSE

Fig. 4—Urine containing added lactose, glucose, and mixtures of lactose and glucose, chromatographed for 24 hours with *n*-butanol, acetic acid, and water as solvent and sprayed with benzidine reagent.

strips, as indicated in fig. 3, before spraying. One urine spot remains on the strip with the controls. The object of this procedure is to enable strips to be sprayed with different reagents as the analysis proceeds. The strip containing the control and urine spots is sprayed with the benzidine reagent. The position of any reducing substance derived from the urine is compared with the controls and the R_F value determined (fig. 4).

RESULTS

This first spraying should indicate whether any reducing substance is a hexose—e.g., glucose, galactose, and fructose—lactose, a pentose, a mixture, &c. Pentoses give a characteristic chocolate-brown spot within 5 minutes (the colour will develop slowly in the cold). Lactose, maltose, galactose, glucose, and fructose form dark-brown spots within 10 minutes. Ascorbic acid gives a pale-brown spot if more than 10 μg. is present in the spot. Urates in the amount normally found in urine give no colour reaction with benzidine. The reagent will detect 5 μg. of all the reducing sugars we have tried. As a rule there is no colour reaction with urine containing pus or blood. Urine grossly contaminated with blood, however, sometimes produces a faint violet spot with an R_F value about 0·28.

If the benzidine reaction indicates a hexose, one of the other strips should be sprayed with the phloroglucinol reagent (figs. 5 and 6). Fructose gives an orange-brown spot with this reagent. Sucrose produces a similarly coloured spot; but, unless the sucrose is associated with a true reducing substance in the urine, the preliminary Benedict's test would be negative. Galactose and ascorbic acid produce faint brown spots. Lactose, maltose, glucose, homogentisic acid, and urates give no colour reaction. Pentoses give a greenish-blue spot after protracted heating or on standing at room temperature for a few hours. The phloroglucinol reagent will detect less than 5 μg. of lævulose and about 20 μg. of pentoses.

If the benzidine spray indicates a pentose, this can be confirmed by spraying with the aniline-hydrogen-oxalate reagent, which gives a bright-red spot, within 5 minutes, with pentoses. Galactose and glucose give a brown spot after 10 minutes. Ascorbic acid produces a faint yellow spot after 15 minutes. Urates and homogentisic acid produce no colour. The reagent will detect less than 5 μg. of pentoses, 5 μg. of glucose and galactose, and 10 μg. of lactose and fructose.

If the urine on the first test strip gives no colour reaction with benzidine, it can be concluded that its reducing action is not due to a sugar. In that case a strip should be sprayed with the ammoniacal silver-nitrate reagent, observing whether a brown or black spot develops in the cold, before heating the strip in the oven. Ascorbic acid and homogentisic acid from alcaptonuric urine produce a black spot immediately in the cold, after spraying with ammoniacal silver nitrate. Urine containing the excretory products of salicylates produces a brown spot on heating, with an R_F value of 0·87. The urates of normal urine give a black spot with an R_F value of about 0·19 and, since these spots are apt to "tail," it is difficult to differentiate dextrose and the other substances with an R_F value in the same region. However, the use of benzidine as the primary spraying reagent obviates this difficulty.

DISCUSSION

The procedure outlined above nas enabled us to identify many reducing substances in urine easily and with an accuracy which we, in a clinical laboratory, could not previously obtain. Though the time taken for an analysis is 24–48 hours, very little of this time is occupied in technical manipulations, and it is rarely that this type of examination is of extreme urgency. The formation of osazones from urine has never been satisfactory except when large amounts of glucose, and glucose alone, were present.

Polarimetry is of little application in a clinical laboratory.

In the procedure outlined we have selected four reagents as sprays. These reagents, together with many others, were already established in clinical pathology as specific or non-specific reagents for test-tube use. We find that most of these other reagents can be used on filter-paper, and some of them are of value in certain circumstances. For example, in the investigation of urine containing the excretory products of salicylates, ferric alum and ultra-violet rays are of particular value. Partridge and Westall (1948) used a naphthoresorcinol reagent which gave a characteristic red with lævulose and sucrose and a blue with pentoses and uronic acids.

The method is open to many modifications according to the inclination of the person performing the test or the

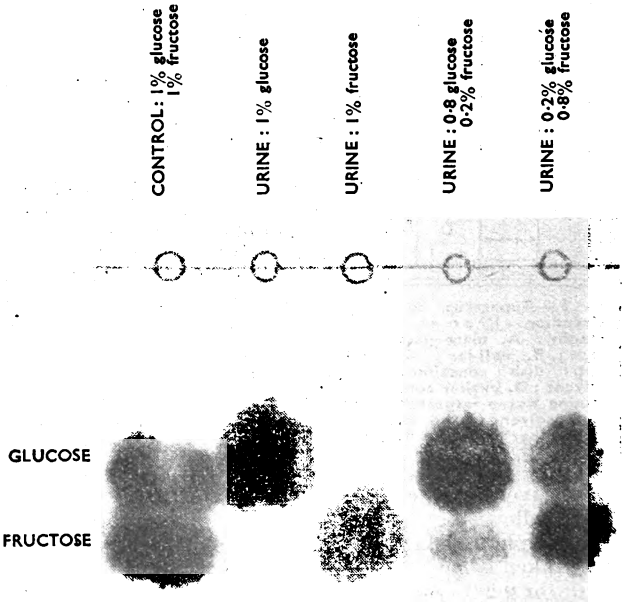
CONTROL : 1% glucose 1% fructose
URINE : 1% glucose
URINE : 1% fructose
URINE : 0·8 glucose 0·2% fructose
URINE : 0·2% glucose 0·8% fructose
GLUCOSE
FRUCTOSE

Fig. 5—Urine containing added glucose, fructose, and mixtures of glucose and fructose, chromatographed for 30 hours with *n*-butanol, acetic acid, and water as solvent and sprayed with benzidine reagent.

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specific purpose of the test. For instance, we have selected lactose and glucose as control spots, because they are the commonest reducing sugars found in urine and their R_F values are nicely separated (fig. 4).

Flood et al. (1947, 1948) have described a method for the quantitative analysis of sugar mixtures by partition chromatography. There is little doubt that the method could be applied to urine if desired.

It is possible to remove various acidic and basic substances from solutions by means of ion exchange resins. Partridge and Westall (1948) and Westall (1948), in their work on tissue extracts, &c., found it necessary to remove certain interfering substances by this method before subjecting the fluids to chromatography. This

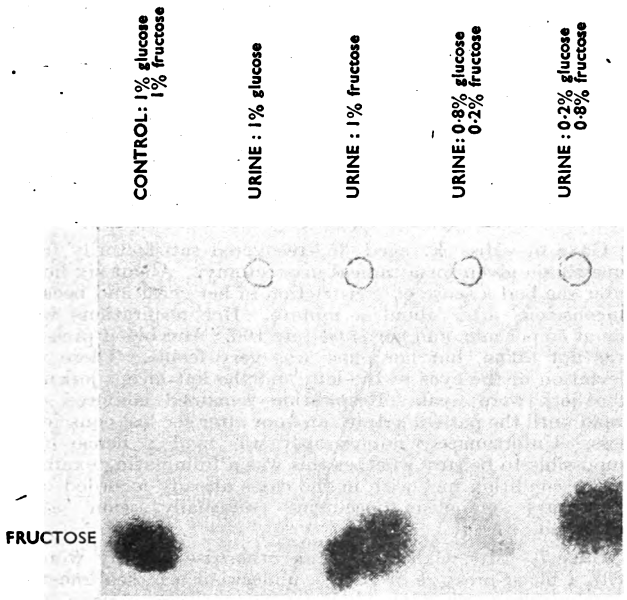

Fig. 6—Urine containing added glucose, fructose, and mixtures of glucose and fructose chromatographed for 30 hours with *n*-butanol, acetic acid, and water as solvent and sprayed with phloroglucinol reagent. The specificity of the reagent for fructose is illustrated.

additional procedure has not been found necessary for the identification of the reducing substances in the urines we have examined to date.

SUMMARY

A method is described, employing partition chromatography on paper, for the identification of various reducing substances which may occur in urine.

This method has practical advantages over those hitherto used.

We wish to thank Dr. A. Neuberger, Mr. D. J. Bell, PH. D., and Dr. H. P. Goldman for gifts of synthetic homogentisic acid, *d*-xyloketose, and alkaptonuric urine respectively, and Mr. R. D. Allan for the photographs.

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A NEW TYPE OF ENCEPHALOPATHY AFTER GENERAL ANÆSTHESIA

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IT has been known ever since the classical work of Courville (1936, 1938, 1939) that some patients have suffered irreparable cerebral damage under anæsthesia. In all the cases described by him and by others (Brewer 1905, Caine 1923, Löwenberg et al. 1936, McClure et al. 1939, Steegmann 1939, Schnedorf et al. 1941, Howkins et al. 1946, Lucas 1946) there has been a definite and well-recognised anoxic episode in the course of the anæsthesia, and it has been generally agreed that the disturbances in these patients could be accounted to the selective destruction of the higher brain cells by deprivation of oxygen. However, some time ago I encountered a case where a fatal cerebral degeneration followed an apparently uneventful anæsthesia. About the same time I heard of other similar cases, and in the last three years I have collected reports of nine. A tenth has recently been recorded, in America, though it was not recognised as unusual (American Society of Anæsthesiologists 1948). Since this condition appears to be a pathological and clinical entity not hitherto described, I want to draw attention to it, in the hope that its rather hazy ætiology may become more clear.

CASE-RECORDS

Case 1.—Mrs. A, aged 38, had a mild hyperthyroidism but was otherwise healthy. Her blood-pressure was 120/80. On Feb. 21, 1946, she underwent a partial thyroidectomy under bromethol, nitrous oxide, oxygen, and ether anæsthesia. The operation and the anæsthesia were uneventful, and the patient slept through the succeeding afternoon, evening, and night.

Next morning she was found to be unconscious. Her eyes were closed; but when her lids were separated her eyeballs were seen to be moving to and fro in the palpebral fissures. Her corneal reflexes were brisk. She ground her teeth occasionally. Her face was symmetrical. Her tendon-reflexes were increased a little and her plantar responses were extensor. Her abdominal reflexes could not be elicited. Respiration was free, and stertor was absent. Her pulse was rapid. She was incontinent of urine. It was presumed that she was unduly sensitive to bromethol, and to expedite her recovery 5 ml. of nikethamide was injected intravenously; it produced grinding of the teeth and a twisting movement of the arms rather reminiscent of a decerebrate fit. Her eyes opened for a moment, but there was no alteration in her state of consciousness. She remained in light coma until death from hypostatic pneumonia five days after operation.

Investigations.—Lumbar puncture on the third day of her illness produced cerebrospinal fluid (C.S.F.) containing 31 white and 750 red blood-cells per c.mm. and an increased amount of protein. Next day the blood-sugar was 100 mg. per 100 ml., and blood-urea 29 mg. per 100 ml.

Necropsy Findings.—The brain was intensely congested and showed multiple subpial hæmorrhages, particularly in the frontal and central areas. There was superficial softening in the region of the right arm area. Section showed that the changes were mainly confined to the grey matter. Microscopically there were multiple small areas of hæmorrhage and softening.

Case 2.—Miss B, aged 51, had carcinoma of the left breast. Her general health was good; her blood-pressure before operation was 130/86. On April 4, 1946, she underwent an uneventful radical mastectomy under nitrous oxide, oxygen, and 'Trilene.' Two hours later she seemed to be sleeping quietly in bed. Ten hours after the operation she was found to be unconscious; her pulse was extremely rapid and her skin pale and cold. Though there was no evidence of excessive blood-loss the condition was treated as one of shock, and 4 pints of plasma were given intravenously. The patient's

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general condition improved immediately, and a slow glucose saline drip was kept going for some time after. Her state of consciousness, however, remained unaltered.

When she was seen next day she was less deeply unconscious; there was some loss of power on the left side of the face and body, and she could not swallow. She had retention of urine, and a catheter had to be passed. On April 7 she had recovered the power of swallowing, and her hemiparesis had gone. Her reflexes were brisk, but she would not be roused or answer when spoken to. She again required catheterisation. She became incontinent both of urine and fæces next day and remained so for the remainder of her illness, but her condition was otherwise unchanged. By April 9 she had a slight haze of albumin in her urine, but her blood-urea was only 42 mg. per 100 ml. From then until her death four days later the unconsciousness steadily deepened. There was a terminal rise in temperature, and congestion at the left lung base. Necropsy was refused.

Case 3.—Mrs. C, aged 51, had a carcinoma of the breast but was otherwise healthy. She underwent an uneventful radical mastectomy under hexobarbitone, nitrous oxide, and oxygen anæsthesia. She recovered normally for the first few hours after the anæsthetic, but during the night after the operation she was found to be deeply unconscious. Nikethamide, picrotoxin, and intravenous fluids were administered without improving her condition. Likewise, 50% intravenous sucrose 70 ml. failed to influence her state of consciousness, which remained unaltered until death took place rather unexpectedly after a sudden collapse 82 hours after operation. Apart from her unconsciousness there were very few signs in the nervous system. Her pupils were small at first but dilated later; her plantar responses became extensor 24 hours before her death; and she was incontinent throughout her illness. There was definite tachycardia for 48 hours after her loss of consciousness. Her blood-pressure was 100/80 the morning after her initial collapse, and by the fourth day after operation had risen to 180/110. Lumbar puncture on the third day after operation produced yellowish clear C.S.F.: the cell-count was normal, but the protein was 200 mg. per 100 ml., and there was opalescence on Pandy's test.

At *necropsy*, 5 hours after death, the entire brain was swollen and very soft, and there was much cerebellar coning. There were multiple small thrombotic hæmorrhagic specks over most of the cortex on both sides and over much of the temporal lobe. Microscopy revealed multiple small areas of softening and hæmorrhage. A small fragment of pia-arachnoid was stained with sudan III, but no fat-emboli were seen.

Case 4.—Mrs. D, aged 55, underwent a radical mastectomy on Aug. 11, 1947. The anæsthetic was nitrous oxide, oxygen, and trilene. Hexobarbitone was used for induction. There was some tendency to cyanosis, and the amount of oxygen required was rather large. The patient recovered and was apparently quite normal four hours after the operation. At 8 A.M. next day she had a sudden attack of diarrhœa and became dyspnœic and slightly cyanosed; she did not complain of pain but lost consciousness shortly afterwards. Her blood-pressure was then 76/40. She had severe cyanosis at times thereafter. Later the same day her blood-pressure had risen to 105/75, though the cyanosis persisted in spite of deeper respiration. No physical signs were detected in the chest on anterior examination. The plantar responses were extensor and the ankle-jerks barely elicited. The pupils were small and unequal, the right optic disc was slightly congested, and the corneal reflexes were present. No other abnormal signs were found on examination of the nervous system. The patient remained in this partly rousable state for two and a half days and died of a purulent bronchitis. Her eyes were often deviated to the right.

Necropsy Findings.—An irregular plaque like a hard tumour 1·6 × 1·5 × 0·9 cm. was found loosely attached to the arachnoid and dura in a depression on the surface of the left cerebral hemisphere. Irregular areas of subpial hæmorrhage with subjacent cerebral softening were present close to the midline on the dorsal surface of the brain. This change was more extensive on the left side than on the right. No thromboses were found in the axillary vein or its tributaries; nor were there any emboli in the pulmonary arteries. The bronchi were filled with thick yellowish-white purulent fluid. The lower half of the left lower lobe and the lower two-thirds of the right basal lobe were collapsed.

Microscopy revealed hæmorrhagic necrosis of the grey matter and cortex, and softening, without hæmorrhage, of the underlying white matter in both cerebral cortices and on the superolateral surfaces and occipital poles but not on the ventral surface.

The cyanosis so prominent in this case may well be due to the fact that when she collapsed this woman had already developed the basal atelectasis found at post mortem.

Case 5.—Mrs. E, aged 45, underwent a radical mastectomy under hexobarbitone, nitrous oxide, and oxygen. She was conscious for 8 hours after the operation and then lapsed into coma with a rising pulse-rate. There were no abnormal neurological signs apart from unconsciousness. On the next two days she showed some signs of recovering consciousness but never fully awoke from her stupor. She died four days after her operation, having been incontinent for the last 36 hours of her illness. Lumbar puncture produced C.S.F. under a pressure of 250 mm. H_2O: it contained 3 cells per c.mm. and protein 25 mg. per 100 ml.; the amount of globulin was not increased.

Necropsy Findings.—Hæmorrhagic areas of cortical softening were found over the temporal lobe in the region of the distribution of the posterior cerebral artery, and over the medial and dorsal surfaces of the right hemisphere in the distribution of the anterior cerebral. The areas were limited to the cortex, though in the underlying white matter there were many dark hæmorrhagic pin-head dots. There was no visible abnormality of the cerebral vessels.

Case 6.—Miss F, aged 35, recovered satisfactorily from anæsthesia given for a radical mastectomy. About six hours later she had a sense of constriction in her chest and became unconscious after about a minute. Her respirations were about 55 per min. and her pulse-rate 160. Her blood-pressure was not taken, but her pulse was very feeble. There was deviation of the eyes to the left, and the left biceps-jerk and knee-jerk were weak. Respiration remained laboured and rapid until the patient's death an hour after she lost consciousness. Unfortunately no necropsy was made; hence it is impossible to be sure whether this was a fulminating example of the condition met with in the cases already recorded or a pulmonary embolism occurring unusually soon after operation.

Case 7.—Mrs. G, aged 40, an otherwise healthy woman with a blood-pressure of 105/75, underwent a radical mastectomy under general anæsthesia (nitrous oxide, oxygen, and trilene). The operation, anæsthesia, and immediate post-operative period were uneventful. Next day at 9 A.M. she had an epileptiform convulsion; she became unconscious, and remained so until her death 55 min. later.

At *necropsy* no definite cerebral lesion was found to explain her death. The brain, however, was congested and œdematous.

Case 8.—Mrs. H, aged 63, had mild chronic bronchitis but was otherwise healthy. Her blood-pressure was 120/80. She underwent an abdomino-perineal excision of the rectum under general anæsthesia. She received 3 pints of blood and 1 pint of plasma during the operation. Next morning she was found to be slightly cyanosed, her general condition was poor, and her breathing was shallow. That evening her pulse-rate was 135 and her blood-pressure 115/80, but she had not fully recovered consciousness since the operation. Next day she still could not be roused; she was restless but was not moving her left arm; her blood-sugar was 191 mg. per 100 ml. and her blood-urea 38 mg. per 100 ml. A day later she was still lightly unconscious; she was flaccid down the left side and had a left plantar extensor response; her blood-pressure was 150/80. She survived for fifteen days after her operation. Though apparently awake for much of this period, she never spoke a coherent sentence: she never quite recovered consciousness, thought she often seemed to be on the point of doing so. She eventually died of a pulmonary infection. Necropsy was refused.

It is impossible to be certain that this woman's death was not due to an ordinary cerebral thrombosis. Her history is included with the others because of the peculiar type of coma.

Case 9.—Mrs. I, aged 42, an otherwise healthy woman, underwent on June 21, 1946, a radical mastectomy under chloroform and ether anæsthesia. She was returned to bed in good condition and presently recovered consciousness and spoke to her husband. The same evening her pulse became rapid and she soon became unconscious. She remained

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in coma until her death 48 hours after operation. Her temperature began to rise during the night after operation and stayed over 100°F throughout her illness. The neurological signs followed the usual indefinite course. On the day after operation her knee-jerks were absent in the morning, though at this stage she occasionally opened her eyes and moved her legs. In the afternoon of the same day she had a bilateral extensor plantar response and right conjugate deviation of her eyes; she sometimes ground her teeth and had some twitching of the right side of her mouth; she was incontinent of fæces and urine. Next day she again had some twitching of the right side of her face, but in general her condition remained substantially unchanged until death.

Necropsy Findings.—The brain was acutely congested; there was a complete pressure cone. In the middle of the right parietal lobe there was an area of softening 8 × 2–3 cm. The blood-vessels in this area were thrombosed, and there was some thrombosis where the vertebral arteries join to form the basilar artery. The other organs showed passive congestion, and there were a few patches of ulceration of the colonic mucosa. The mastectomy wound was sound.

DISCUSSION

The most obvious explanation of the above cases is, of course, that the patients died of cerebral thrombosis. In several respects, however, the signs and symptoms differed from the classical ones of a cerebral vascular accident. Thus the striking feature was not unilateral paralysis with gradual recovery, though this was observed in a few of the patients; instead there was a persistent light coma in which the patient often seemed on the point of awakening but never did. Such a state has been described after ligation of both anterior cerebral arteries (Poppen 1939) and as a result of other lesions in the anterior part of the brain (Dandy 1946); it has been named parasomnia by Jefferson (1944), who regards its cause as interference with the function of the centre for consciousness in the hypothalamus. The course of these cases, too, was not that of a cerebral thrombosis; for there was no real recovery of consciousness after the initial accident. It is interesting that death was brought about by a respiratory infection; consequently those treated most energetically with intravenous fluids and bacteriostatic agents survived longest. No non-fatal case of the condition has been observed so far.

The incidence of these cases is interesting. Of 1000 patients who underwent radical mastectomy at the Christie Hospital between February, 1937, and November, 1947, 5 died of cerebral disturbances, and 4 of these cases are included in the present series. There were no cases of the kind during the same period among 1000 patients undergoing other operations under general anæsthesia. It therefore seems to be no accident that most of the present cases followed radical mastectomy. For this reason it is impossible to state with any certainty that these complications tend to follow the use of any particular drug. If they are associated with mastectomy it follows that they will be associated with the use of the non-explosive mixtures of nitrous oxide, oxygen, and trilene used for that operation; but a sufficient number have followed other agents to make it clear that no single anæsthetic can properly be held responsible.

The second strange feature of this symptom complex is the fact that it does not seem to have been met with before 1946. The first case recorded in the Christie Hospital occurred in July of that year. In the preceding $8^1/_2$ years only one patient developed a cerebral thrombosis after operation; she presented with a hemiplegia, and at necropsy a typical wedge-shaped infarct was found. To obtain further information the cancer records of the Manchester Royal Infirmary were examined. These comprise some 900 patients for each year, though not all of them are operated on. Even so, from 1940 to 1945 there were no fatal post-operative cerebral complications. There was one in 1946 (case 7 of this series) and one in 1947 (case 8). It therefore looks as though this is really a new condition and not merely one which has come to light simply because it has been looked for.

The exact significance of the pathological changes is difficult to assess. The lesions were widely distributed through the brain and, though perhaps more pronounced in some areas than in others, on the whole were more characteristic of the action of some noxious agent carried in the blood-stream than of any particular local pathological process. Changes of the kind have been reported in patients who died of hypertensive encephalopathy; they have also been reported recently by Lucas (1946) after anoxic accidents in the course of anæsthesia. In the present series both these causes can be ruled out. Where the blood-pressure had been taken before operation it was found to be normal. It is, however, interesting that an exactly similar symptom complex did develop after an extensive sympathectomy for hypertension, but because of the possibility of confusing this with hypertensive encephalopathy this case has not been included in this group, though the patient's blood-pressure was low when he became unconscious. The post-mortem changes, too, were not quite the same, in that only congestion and œdema were found. Anoxia is also unlikely to be the cause, for two reasons: (1) the anæsthetics were given in almost every case by skilled anæsthetists; and (2) several of the patients were apparently normal for a few hours after the operation and did not become ill until some 6–18 hours after the operation was over. It is difficult to see how a patient whose brain had been irreparably damaged by anoxia during anæsthesia could recover consciousness sufficiently to talk intelligently, and then pass into irreversible coma.

Four cases rather similar to those reported here have been described by Wolf and Siris (1937), including one in a patient who, though then suffering from left hemiplegia and paresis of the right leg, regained consciousness and spoke, only to relapse into coma three days after operation. The post-mortem findings in these cases cases were very similar to those reported here, but in every case the patient had had a severe fall in blood-pressure while sitting upright during the operation. Further, in three of the cases only local anæsthesia was used, and the patients (all rather elderly) lost consciousness when the blood-pressure fell. Probably this group of cerebral disturbances can properly be ascribed to anoxia of the brain, and in spite of their apparent similarities to the present cases they may have a different pathogenesis. It is, however, interesting that Wolf and Siris believe that cerebral vasospasm, which has been thought to play some part in the rather similar lesions caused by carbon-monoxide poisoning (Hiller 1924), may have been the initial disturbance in their cases. Though it is impossible to exclude this factor from the ætiology of the present cases, no useful purpose is served by presuming that it had occurred, since it at once becomes necessary to explain what caused the cerebral arterial spasm.

There is one other possible explanation of the changes, and that is fat-embolism. This would adequately explain why some patients apparently recovered from the anæsthesia to lose consciousness later. It would also explain the sensation of tightness in the chest, the hypotension, and the diarrhœa which occasionally appeared at the time of loss of consciousness. But at necropsy no fat-emboli were found, though a careful search was made for them in three cases. Consequently it becomes necessary to postulate the development of embolism from some other source to explain the syndrome, though what it can be is far from plain; nor is it clear what change has taken place in the techniques of surgeons or the methods of anæsthetists to make this form of embolism suddenly appear as a new disease.

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SUMMARY

A new type of encephalopathy, which appears after general anæsthesia, is described.

It is characterised by the onset of light coma without any very definite localising signs in the nervous system some hours after recovery from general anæsthesia.

The usual necropsy findings are congestion of the brain, multiple subarachnoid hæmorrhages, and some areas of cerebral softening.

The cause is not clear, but it is certainly not ordinary cerebral thrombosis, nor is it anoxia.

The condition appears to be a new clinical entity which has made its appearance in the last few years.

I am greatly indebted to those of my colleagues who have supplied me with accounts of their cases, to the pathologists on whose reports I have drawn, and particularly to the staff of the Christie Hospital and Holt Radium Institute for case-records and statistics.

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INJECTION TREATMENT OF HYDROCELE*

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THE treatment of hydrocele by aspiration and injection in the outpatient clinic is, I believe, preferable and superior to treatment by operation.

One of the earliest accounts of injection therapy is that of Samuel Sharp, surgeon to Guy's Hospital, who injected hydroceles with spirits of wine in 1733 (Sharp 1747). This method of cure, though from all accounts effective, was exceedingly painful and was almost as formidable as the radical cures by incision, the tent, or the seton, which were performed surgically at that time.

Sir James Earle, senior surgeon to St. Bartholomew's Hospital in 1790, used to inject hydroceles with "port wine, one-third part, and a decoction of red rose leaves, two-thirds parts" after withdrawing the hydrocele fluid. In the 61 cases which he published the results appear to have been surprisingly good, for the injection caused little pain, and, after a week or two of mild inflammatory reaction, cure usually took place (Earle 1805).

Even today the results of operative treatment of hydrocele are not entirely satisfactory. Œdema of the scrotum and hæmatoma formation are not infrequently seen after operation and may cause a tiresome delay in convalescence. Furthermore, operation does not guarantee against recurrence, though it usually produces a permanent cure.

Campbell (1927), commenting on 502 cases of radical surgical cure of hydrocele, found that recurrence had taken place in 6%, and that 13% had become infected, 8 of these requiring orchidectomy. He further stated that hæmatoma formation and testicular atrophy were common complications.

Injection therapy can produce results superior to this. Ewell et al. (1940) observed 165 cases in which quinine urethane had been used, and found that recurrence had taken place in 4·3%. James (1941), using the same sclerosant, was successful in all of 74 cases. Robertson (1941) found that 7 patients with large hydroceles remained cured two years after injection with sodium morrhuate. Diamond (1942) reported good results in all of 76 cases treated by injection. Foote (1943) claimed 95% of successes with quinine urethane.

The small series of cases that I report here were treated on the lines suggested by Foote (1945). Of 18 cases treated by injection, 12 had vaginal hydroceles and 6 had spermatoceles. In 16 one injection sufficed, in 1 two injections were given, and in 1 three injections. Of the 15 patients who returned for examination between eight and twenty months after injection, in 15 no fluid remained and it was extremely difficult to perceive on which side the hydrocele had been; in 1 case fluid reaccumulated in spite of three injections, and this man has since had the radical cure by operation; and 2 patients could not be traced.

TECHNIQUE

Provided that no clinically obvious contra-indication exists (see below), the scrotum is washed and shaved, and the patient lies supine upon a couch. Transillumination is used to confirm that the testis is lying posteriorly. To a small area of scrotum over the upper pole of the hydrocele tincture of iodine is applied; this is not painful provided that the scrotum is not swamped with iodine. A weal of 2% procaine is next raised, and through it a large aspirating needle is thrust into the tunica vaginalis, care being taken to pass it between visible blood-vessels. Fluid is expressed by squeezing gently on the scrotum, as much as possible being evacuated, for if any is left behind it dilutes the sclerosant and renders it less effective. At this stage the testis and epididymis are carefully palpated to exclude an underlying pathological lesion. Whether the aspirated fluid is that of a hydrocele or of a spermatocele, 6 ml. of quinine urethane is injected and is massaged round the sac. The needle is withdrawn, and the puncture is sealed with collodion and a wisp of cotton-wool.

The injection is usually not felt by the patient, but slight transient pain referred to the testis, groin, or loin may occasionally be felt. The patient is sent home with instructions to report in a month or to return earlier should pain occur. He may wear a suspensory bandage if he wishes. There is usually a little œdema of the scrotal tissues, together with a small accumulation of fluid in the hydrocele sac for about a week following the injection, but this is not of great moment and is absorbed in due course; it may be aspirated if it inconveniences the patient. A second or third injection may on occasion be required, and in a loculated hydrocele each loculus requires a separate injection. Final assessment of the result should not be made until six months have elapsed, for fluid may persist up to that time and undergo resolution of its own accord.

Quinine urethane is not toxic in the tunica vaginalis, since it is not rapidly absorbed from there (Foote 1943). 'Ethamolin' has been used as a sclerosing agent, but it is excessively painful after injection, and for this reason I do not use it.

CONTRA-INDICATIONS

Contra-indications to injection are obvious organic disease of the testis or of the epididymis requiring separate treatment, and the acute hydrocele associated with trauma or with epididymo-orchitis. Injection should not be used in the congenital type of hydrocele lest the

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sclerosing fluid permeate the general peritoneal cavity. Most workers are agreed that, in infants, tapping alone is curative and that injection is unnecessary. Some workers affirm that the additional presence of inguinal hernia should preclude the injection of hydroceles (O'Crowley and Herzlich 1944), but the reason for this is not clear, though O'Malley (1943) describes how Edward Gibbon died after the aspiration of an exceeding capacious hydrocele associated with a massive inguinal hernia. In this case it seems that the hernia had been aspirated as well—a gross technical error.

CONCLUSION

I submit that injection with quinine urethane is the treatment of choice in idiopathic hydrocele, for its results are at least as good as, and probably superior to, the results of operation. Furthermore, the patient is spared the inconvenience of an operation, the expense and loss of work consequent on inpatient treatment, and the very small but ever present risk of anæsthesia.

It is a pleasure to thank Mr. R. L. Holt for his inspiration and advice in writing this paper.

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RETARDED GROWTH OF LIMBS AS A SEQUEL OF ENCEPHALITIS LETHARGICA

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THE effect of neurological disorders—especially poliomyelitis—on the growth of limbs affected in childhood is well recognised. The failure of limbs to develop fully in some cases of infantile hemiplegia is perhaps less well known. A similar sequel to encephalitis lethargica does not seem to have been described; so I report here certain observations made on three patients seen by Sir Arthur Hall at the clinic started by him in 1925 for patients suffering from the sequelæ of encephalitis lethargica. These patients had all had epidemic encephalitis at an early age, and the sequelæ were unilateral and of a minor degree.

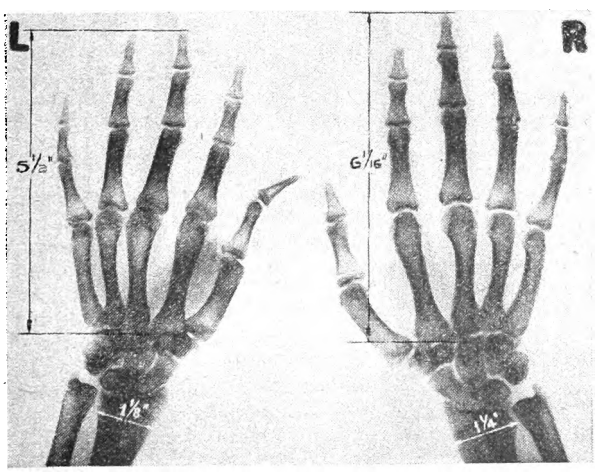

Fig. 1—Hands of case I.

CASE-RECORDS

Case 1.—A boy, aged 13, had acute epidemic encephalitis in March, 1924, when 11 years old. The onset was sudden, with vomiting and lethargy. There was no diplopia. After the acute attack the patient had nocturnal insomnia until Christmas, 1925.

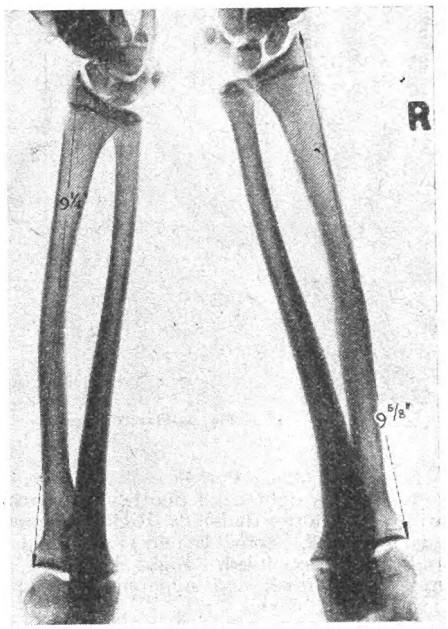

Fig. 2—Forearms of case I.

May, 1926.—Complaining of pain and weakness in the left leg. Nystagmus present. Pupils react normally. No abnormal physical signs in legs. No tremor of tongue. Walked "like a person with a stroke."

September, 1926.—Drags left leg, and left arm does not swing at all. Left arm and leg more resistant than the right to passive movement. No difference between the knee-jerks on the two sides.

October, 1926.—Sometimes he can run, but on walking he drags his left leg. Left knee-jerk greater than the right, but the right ankle-jerk greater than the left. Right plantar reflex was brisker than the left; flexion of the toes slight, with general dorsiflexion of the foot.

June, 1927.—Hardly ever uses his left arm. Circumference of left thigh 20½ in. and of right 21½ in.; the circumference of left calf 9½ in. and of right 10½ in. Knee-jerks and ankle-jerks unaltered. Left plantar reflex extensor, but right flexor.

July, 1929.—Has been in camp with Scouts; cycles long distances.

February, 1930.—Plays full-back at football. Can kick nearly as well with his left leg as with his right. After playing for half an hour can run nearly normally. Much more use than previously in left leg. Left arm, some tremors. No parkinsonian facies.

August, 1931.—Leg and arm measurements as follows:

Right side		*Left side*		*Proportional difference*
Length of leg ..	31⅝ in.	Length of leg ..	31¼ in.	1·2%
Circumference of thigh	18 in.	Circumference of thigh	16⅛ in.	8·3%
Circumference of calf	11½ in.	Circumference of calf	10¾ in.	6·5%
Length of upper arm	9¼ in.	Length of upper arm	7⅞ in.	15·3%
Length of forearm	8¾ in.	Length of forearm	7⅜ in.	17·2%

In 1935 the measurements of the upper limb were:

Length of right arm	10½ in.	Length of left arm	8⅞ in.
Length of right forearm ..	10 in.	Length of left forearm ..	8½ in.

X-ray photographs of the hands and forearms were taken in 1931 and are reproduced in figs. 1 and 2.

Case 2.—A boy had epidemic encephalitis at the age of 12 years at Easter, 1924. He was drowsy, but not laid up or away from school. In autumn of the same year his right hand was weak and tremulous, and his right leg weak at the knee.

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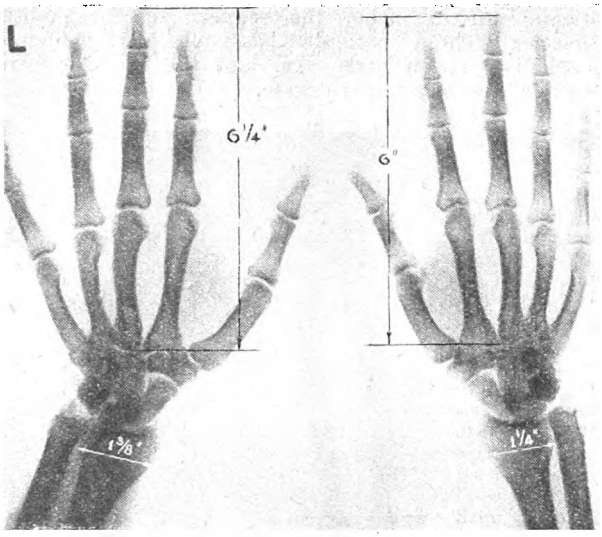

Fig. 3—Hands of case 2.

November, 1926.—Perfect in every way, except for a slight tremor of his right hand (mother's statement). Right upper arm ¾ in. shorter than left. Rigidity increased; tendon-jerks not increased. Some tremor; arm held with wrist flexed and fingers extended. Right knee-jerk greater than left. Ankle-jerks brisk and apparently equal. Plantar reflexes both slightly flexor.

February, 1927.—Right leg drags more.

March, 1927.—Drags his right leg in walking, but can ride a bicycle quite well.

February, 1928.—Still at school. Right arm and leg stiff. Not so slow as he was. Tremor still present.

April, 1929.—Working since June, 1928, and has not lost a day. Cycles four times a day.

June, 1930.—Carries on just the same, but hand and leg bad. "Strong and can pull things nobody else can."

January, 1931.—Feels cold less than before, preferring winter to summer.

July, 1931.—"The difference in the size of his hands is surprising." The right leg drags a lot and is about 1 in. shorter than the left.

August, 1931.—Leg and arm measurements are:

Right side		*Left side*		*Proportional difference*
Length of leg ..	35⅛ in.	Length of leg ..	34⅛ in.	2·85 %
Circumference of thigh	17 in.	Circumference of thigh	18¾ in.	9·33 %
Circumference of calf	12 in.	Circumference of calf	12½ in.	4·00 %
Length of upper arm	9 in.	Length of upper arm	9¾ in.	7·69 %
Length of forearm	9⅛ in.	Length of forearm	10 in.	8·75 %

The hands and forearms were radiographed (figs. 3 and 4).

May, 1938.—Looks well just as before, but not working now. Right hand more fixed. Still very wasted. Much slower in movements; otherwise no apparent change.

June, 1940.—Looks well. Right arm, posture, wasting, and tremor as before.

This boy was originally right-handed; but, when his right arm became affected, he developed the use of his left hand.

Case 3.—A boy, aged 11, had diplopia for three days in March, 1924. He did not go to bed but had had nocturnal insomnia and headache. He was not lethargic in the daytime. He did not seem to recover completely and developed weakness, stiffness, and some tremor of the left arm.

August, 1926.—No parkinsonian facies. Right pupil larger than left. No salivation. Paralysis of left lower face. Left arm-posture like that of hemiplegic; tremor +; rigidity not marked; tendon-jerks not increased. Left leg: walks with knee stiff; weakness at hip; no marked rigidity; tendon-jerks not increased.

June, 1927.—Considerable wasting of left arm and leg; extensors of left knee much wasted. Right knee-jerk greater than left. Plantar reflexes flexor. All muscles in left arm and leg respond normally to faradism.

April, 1928.—No change except for some tremor in left arm and leg.

August, 1931.—No abnormality of facies. Measurements of the limbs as follows:

Right side		*Left side*		*Proportional difference*
Length of leg ..	30⅝ in.	Length of leg ..	31½ in.	2·8 %
Circumference of thigh	18½ in.	Circumference of thigh	16¾ in.	9·45 %
Circumference of calf	12⅜ in.	Circumference of calf	11¾ in.	5·0 %
Length of upper arm	9¾ in.	Length of upper arm	8½ in.	12·8 %
Length of forearm	8¾ in.	Length of forearm	8 in.	8·6 %
Length of dorsum of hand ..	5 in.	Length of dorsum of hand ..	4⅜ in.	12·5 %

The hands and forearms were radiographed (figs. 5 and 6).

1936.—Damage limited to left arm and leg. No alteration in "facies" or speech. Says that eyes twitch and blink, especially if he is in a tram or stands watching anything. Tremor of left hand when excited. He has grown into a strong man, able to do work which includes heavy lifting. Except for an obvious limp and some stiffness of the left arm, there is now no defect. The left arm shows slight tremors occasionally, chiefly in the thumb.

This patient was originally right-handed and remains so, his left side being affected.

The measurements made from the X-ray photographs show the smaller sizes of the bones in the affected forearms and hands:

	Length of radius	*Width of lower end of radius*	*Length from base of 3rd metacarpal to top of terminal phalanx*
Case 1 ..	Rt. 9⅝ in.	Rt. 1¼ in.	Rt. 6 1/16 in.
	Lt. 9¼ in.	Lt. 1⅛ in.	Lt. 5¼ in.
Case 2 ..	Rt. 9¾ in.	Rt. 1¼ in.	Rt. 6 in.
	Lt. 10–10 1/16 in.	Lt. 1⅜ in.	Lt. 6¼ in.
Case 3 ..	Rt. 9½ in.	Rt. 1¼ in.	Rt. 5½ in.
	Lt. 8⅞ in.	Lt. 1 1/16 in.	Lt. 5 1/16 in.

In each of the three cases there is little doubt that the acute attack was epidemic encephalitis. Case 1 had typical nocturnal insomnia for many weeks. Case 2 had nothing absolutely typical, but his illness began when the epidemic was at its height; and he was "drowsy"—a very unusual symptom in a boy of his age. Case 3

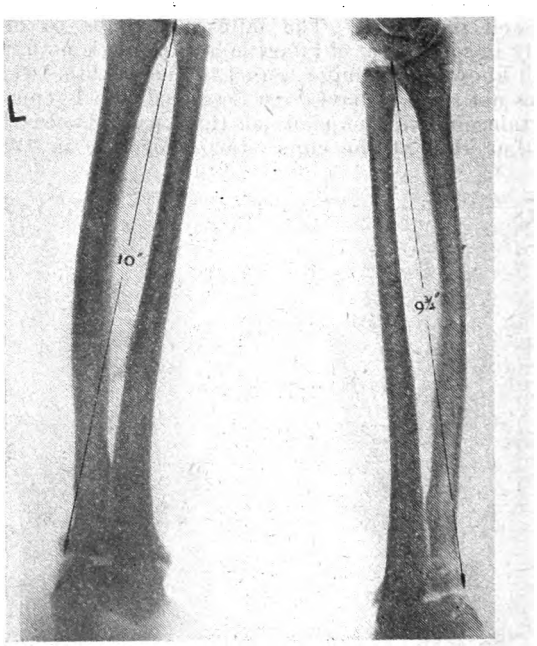

Fig. 4—Forearms of case 2.

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had diplopia for three days, followed by nocturnal insomnia. The sequelæ which developed in each case were parkinsonian in type but one-sided and only partially developed. They all showed slowness of movement, with loss of swing, but tremor was minimal in all of them.

DISCUSSION

The arrest of growth which takes place in limbs affected by poliomyelitis is generally explained either as a result of interference with the normal trophic impulses to the limb or as a disuse atrophy, or both.

The rapid wasting of muscles separated from the corresponding anterior-horn cells indicates that these cells are in some way essential for the nutrition of muscles. In a disease in which these anterior-horn cells are predominantly affected it would be reasonable to expect underdevelopment of muscles. Muscles waste rapidly also when they are immobilised, as in a plaster cast. Whether this disuse atrophy is the entire explanation of the wasting in diseases of the lower motor neurone is problematical.

The lack of growth of the limb, as distinct from the muscles, is not easy to explain. It may be related to diminished blood-supply to the limb as a whole because of the paralysis, or to lack of rather hypothetical trophic influences which supposedly depend on the integrity of the lower motor neurone.

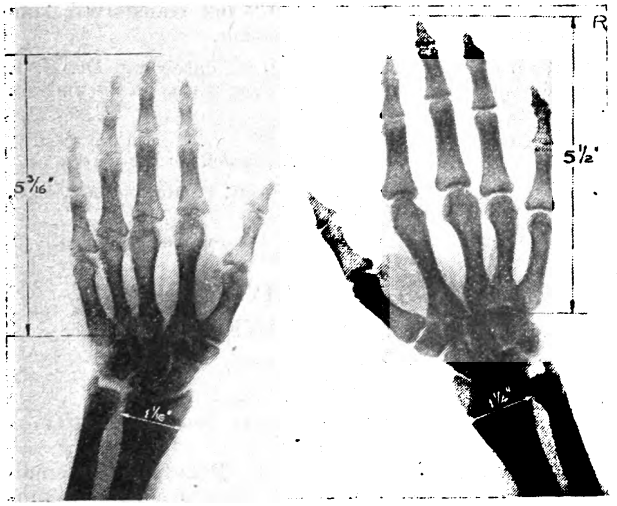

Fig. 5—Hands of case 3.

The explanation of arrested growth of limbs in infantile hemiplegia is even more difficult. The lower motor neurones are intact, and the muscles do not generally waste to any considerable degree in such circumstances. Also, the tone of the muscles is generally increased, which means that there is an increased physiological activity of the muscles at rest, though the additional activity associated with movement is generally reduced because of the poverty of movement which is usually associated with spasticity and rigidity. The degree of wasting, however, in hemiplegia is not necessarily proportional to the degree of paralysis but appears to be more definitely related to the amount of cortical sensory loss (Chatin 1900), and there is evidence that the degree of destruction to the parietal lobule may determine the degree of atrophy (Guthrie 1918, Silverstein 1931).

Penfield and Robertson (1943) described cases in which there was retardation of growth of bones, as well as muscular wasting, associated with epileptic attacks due to local cerebral lesions. They found that the only common factor was involvement of the postcentral cortex, and this had been injured before the age of 3 years. Unfortunately they had no cases in which the Rolandic area had been injured after the age of 2 years and within the growth period, and so they were unable to draw any conclusions for this period.

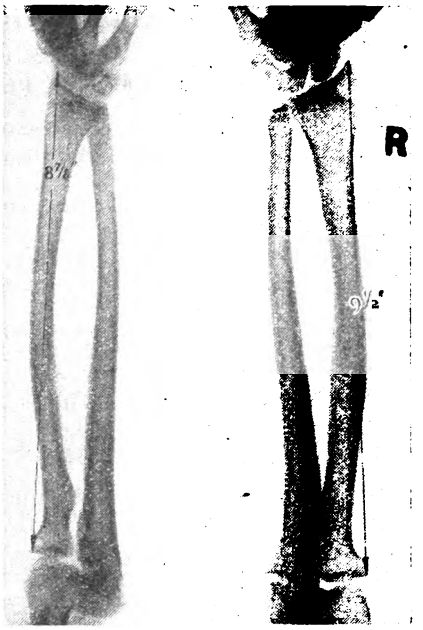

Fig. 6—Forearms of case 3.

The three cases described above show that growth may be arrested in another type of neurological disease—one in which the extrapyramidal tracts are predominantly affected. The lesions in acute epidemic encephalitis are scattered widely throughout the brain, and in typical postencephalitic parkinsonism are generally regarded as being maximal in the basal ganglia, particularly the substantia nigra. Possibly this arrest of growth may also be due to involvement of extrapyramidal tracts. The effect of diminished movement of the affected limb must also be considered as a possible explanation. The relative differences between the development of the arms and legs in case 1 shows that the arrest of growth is more pronounced in the arms. In the other two cases the relative differences are approximately equal in the arms, forearms, and thighs, but less in the lower legs. One would expect the effect of diminished movement to be less in the legs, because in a growing boy the restriction of movement would tend to be greater in the arms than in the legs. The affected leg has to be used whenever the boy stands or moves about, whereas he would be able to amuse himself quite well by using only one arm.

In Penfield's and Robertson's cases, however, there was very little paralysis, and disuse atrophy could have played little part in the arrest of growth.

I wish to thank Sir Arthur Hall for allowing me to publish these cases and for much helpful criticism, and Dr. J. L. A. Grout for the X-ray photographs.

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Silverstein, A. (1931) *Ibid*, **26**, 237.

"... Serious mistakes in diagnosis are still almost invariably due to neglect or misuse of the relatively simple and established methods of the bedside and clinical side-room. The ghosts of patients that haunt us at the midnight hour may have picked up some of the new jargon, and may express themselves less elegantly than they did, but it is still 'why did you not do a rectal ?' or 'Why did you not test my urine properly ?' they ask, rather than 'what was the electrophoretic pattern of my plasma globulin ?' or 'why did you not appreciate the ætiological significance of the mitralisation of my cardiac outline ?' ... We believe, in short, that good clinical method is still the root of the matter."—R. H. and D. H. in preface to 12th edition of Hutchison and Hunter's *Clinical Methods*, London, 1949.

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ABDOMINAL RELAXATION WITH DECAMETHONIUM IODIDE (C10) DURING CÆSAREAN SECTION

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FOLLOWING the suggestion by Paton and Zaimis (1948) of the clinical potentialities of decamethonium iodide (C10) in producing muscular relaxation, Organe (1949) and Hewer et al. (1949) reported preliminary trials of it in anæsthesia. Before decamethonium iodide can be used with confidence, in anæsthesia during cæsarean section, it is desirable to know if it blocks fœtal neuromuscular transmission and if it crosses the placental barrier during the operation. The following observations throw some light on these two questions.

ACTION ON FŒTAL RESPIRATORY MUSCLES

This was investigated in urethanised near-term pregnant rabbits and guineapigs by intravascular injection of lively fœtuses having a good placental circulation; a dose of C10, equivalent weight for weight with that required to paralyse all the respiratory muscles in the adult, was injected into an umbilical vein. Instantaneous twitching of the muscles was followed by paralysis, which was complete in 1 minute and had not worn off after an hour. Provided the hæmorrhage from the umbilical vein was not great, the fœtal heart-rate did not decrease during this period. In addition, observations on isolated phrenic-nerve-diaphragm preparations, from near-term fœtal rabbits and guineapigs and human fœtuses 18–22 weeks old, also show the blocking action of C10, in Tyrode's solution, in concentrations equivalent to those expected to be present in the blood with a paralysing dose. The block was not reversed by pentamethonium iodide.

PASSAGE THROUGH THE PLACENTA

In near-term pregnant rabbits and guineapigs, under urethane or pentobarbitone sodium anæsthesia, continuous recordings were made of the maternal blood-pressure (below 80 mm. Hg the placental circulation became inadequate and the fœtus moribund), contractions of the maternal gastrocnemius muscle (elicited by stimulation of the peripheral end of the sciatic nerve), and the mass reflex movement of the fœtus when a hind leg was pinched. Intravenous injections of C10 into the mother, in doses of 0·07–0·1 mg. per kg. of body-weight, caused paralysis of the sciatic-gastrocnemius response, with recovery in 15-20 minutes, but no diminution in the fœtal response. Larger doses, up to 10 mg. per kg. of maternal body-weight, caused cessation of respiration, with a permanent paralysis and, again, undiminished fœtal responses during an hour's observation. The placenta is therefore a very effective barrier to the passage of C10 from the maternal to the fœtal circulation.

Nor did C10 pass the placental barrier from the fœtal to the maternal circulation. In urethanised near-term rabbits and guineapigs the response of the gastrocnemius to stimulation of the sciatic nerve was recorded and the paralysing dose of C10 determined; after recovery the same amount was injected into the umbilical artery of one fœtus. No depression in the response of the maternal gastrocnemius was observed during an hour with these or higher concentrations of C10 in the fœtal blood-stream.

DISCUSSION

The clinical experience of Organe (1949) suggests that, in the human placenta also, C10 does not pass readily from the mother to the infant; entirely satisfactory results were obtained when 3 mg. of C10 was given intravenously to several women at least 10 minutes before delivery by cæsarean section. d-Tubocurarine chloride will also paralyse fœtal neuromuscular transmission; but Gray (1947) and Buller and Young (1949) have shown that, in man and the rabbit, the placenta presents a very efficient barrier to its passage from the maternal to the fœtal circulation. C10 has not been shown to cross the placenta from the fœtus to the mother, but *d*-tubocurarine chloride does cross it slowly. Repeated or large doses of C10 do not depress the arterial blood-pressure, and this seems to be a very important reason for substituting C10 for *d*-tubocurarine chloride whenever possible.

CONCLUSIONS

C10 blocks neuromuscular transmission in the viable fœtus of the rabbit and of the guineapig and in isolated diaphragm-phrenic-nerve preparations from these and from human fœtuses 18–22 weeks old.

In rabbits and guineapigs the placenta forms a very effective barrier to the passage of C10 from the maternal to the fœtal circulation; it does not cross even when present in the maternal blood-stream in concentrations 50–100 times the paralysing dose.

In rabbits and guineapigs C10 is not transferred from the fœtal to the maternal circulation.

My thanks are due to Dr. W. D. M. Paton and Dr. E. J. Zaimis for supplying me with C10 before it was on the market.

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PROGUANIL PROPHYLAXIS AND INTERCURRENT INFECTION

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THE early claims that proguanil ('Paludrine') in small weekly doses (100 mg.) was sufficient to ensure chemoprophylaxis against infection with subtertian malaria are now generally regarded as incorrect. The official dose recommended in many tropical countries, in the light of past failures, has been raised to 100 mg. daily for the non-immune adult. Recently Covell et al.,[1] after prophylactic trials with proguanil against the Lagos strain of *Plasmodium falciparum* at Horton, state that "the prophylactic dosage recommended for non-immune adults exposed to malarial infection in West Africa is 100 mg. daily." Though this high dosage seems adequate in most cases, the following records suggest that it may be insufficient in the presence of intercurrent infection.

Case 1.—A British male, aged 27, was seen in Wad Medani Civil Hospital, Anglo-Egyptian Sudan, in April, 1948. He had been in the Sudan for six months and had been taking proguanil 100 mg. daily for the preceding four months. He was suffering from multiple boils (axilla, face, buttocks, &c.) and was treated as an outpatient with incisions and local dressings. Prophylactic proguanil was also continued. After three weeks, when the boils were subsiding, the patient developed subtertian malaria, with a positive blood film. After two days' slight fever (100°F) and headache, response to treatment was rapid and uneventful.

Case 2.—A Greek female, aged about 33, was seen in Wad Medani Civil Hospital in May, 1948. She had been in the Sudan for about nine years. She had had subtertian

1. Covell, G., Nicol, W. D., Shute, P. G., Maryon, M. *Brit. med. J.* 1949, i, 88.

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malaria twice (in 1942 and 1944) and had been taking proguanil 100 mg. daily for the two preceding months. Her present complaint was of five days' moderately severe diarrhœa. Blood and mucus were found in her stools, together with actively motile forms of *Entamœba histolytica*. The patient refused admission to hospital and was treated with emetine gr. 1 intramuscularly for ten days in the outpatient department. Her diarrhœa cleared but was succeeded, on the day after the last injection, by fever (101°F), joint pains, and headache. A blood film showed ring forms of *P. falciparum*. Prophylactic proguanil had been continued up to the onset of fever. The bout of malaria was very mild, pyrexia lasting only two days. Treatment was with proguanil 200 mg. thrice daily for ten days.

Case 3.—A British male, aged 43, was seen at Ibadan, Nigeria, on Dec. 6, 1948, complaining of nine days' lassitude, nausea, joint pains, and an occasional rise of temperature. He had been taking proguanil 100 mg. daily since July 1, 1948. Though there were no abnormal physical signs and the blood film was negative, the dose of proguanil was increased to 200 mg. t.d.s.

On Dec. 11, 1948, the patient noted that his urine was dark, and bile pigment was found in it. In the next few days he developed a definite hepatitis (icterus, biliuria, bruising of the skin, and slight hepatomegaly). This was most probably a virus hepatitis, since his wife had had a similar, but milder and non-icteric, illness some three weeks previously. He was therefore treated with a diet rich in protein, sugar, and vitamins. At the same time he was kept on proguanil 100 mg. daily. Improvement was rapid.

On Jan. 4, 1949, while convalescent, the patient suddenly developed a temperature of 101°F. A blood film showed a heavy infection with ring forms of *P. falciparum*; but pyrexia lasted only an hour and was accompanied by slight headache only. A course of proguanil 200 mg. t.d.s. was continued for ten days. There were no further symptoms.

COMMENTS

It seems certain that all of these patients were actually taking the proguanil. They were all conscientious and were emphatic that they had not missed a single day. There was no possibility of confusion of the blood slides, and in each case the ring forms of *P. falciparum* were easily seen.

The explanation of these "break-throughs" is not clear. In no case was there any vomiting. In case 2 the proguanil was possibly not being absorbed, because of the diarrhœa, though this seems unlikely because the diarrhœa was mild and the therapeutic level of the drug is low (6 μg. per 100 ml.).[2] In case 3 the liver damage may possibly have interfered in some way with proguanil metabolism. In each case malaria developed while the patient was recovering from an intercurrent infection (multiple boils, amœbic dysentery, and virus hepatitis).

CONCLUSION

It is established practice in some parts of the world to increase the dosage of prophylactic quinine or mepacrine if the patient has an intercurrent disease, however slight. The present cases indicate that the same procedure should be adopted with prophylactic proguanil, at least until further research has been done on the metabolism of this drug. It is therefore recommended that at least 200 mg. daily should be given for malaria prophylaxis both during and in the convalescence following any intercurrent infection.

I wish to thank Prof. Alexander Brown, of the Department of Medicine, Ibadan, for permission to publish this article.

2. Personal communication from T. H. White.

Reviews of Books

Society and the Criminal

Sir NORWOOD EAST, M.D., F.R.C.P., lecturer in forensic psychiatry, Maudsley Hospital medical school. London: H.M. Stationery Office. 1949. Pp. 315. 10*s*.

Sir Norwood East's book is one which no student of crime, or of society, will wish to miss. Its author occupies, and, one might surmise, enjoys, a position from which he can reply to revolutionaries who class him as a reactionary, and reactionaries who fear him as a revolutionary, while holding the respect of both. His book is written with human understanding, and out of profound experience. His respect for the practical issue, and his distrust of the trend towards speculative and propagandist psychiatry, are a rebuke, tacit as well as spoken, to much that is written on penology and the mental processes of crime.

The book covers, in essay form, many particular and some general aspects of criminal psychology and psychiatry. The studies of criminal responsibility make a valuable preparation—and deterrent—for the would-be expert witness, and the paper on alcoholism is equally useful. While most readers will find points of issue with the author, few will be able to contradict him on questions of experience, and all will repeatedly find things well said which have needed saying. The main criticism which might be levelled at the book is that it does not examine more fully the credentials and demands of the law itself, and of the environment to which the delinquent fails to adapt himself. The discussion of sexual offences, for instance, while it deals fully with the anthropological background, contains no criticism in terms of biology or sociology of the pattern of behaviour which the law seeks to impose. It is startling, too, to find "agitators, conscientious objectors . . . publicists, cranks" united in the class of unmodifiable antisocial psychopaths, since almost all the pioneers of penal reform fall into one of these categories. Into the wider field of the psychopathy of governments and of societies Sir Norwood does not enter, nor does he commit himself to define the point at which the psychiatrist must strengthen, rather than attempt to remove, the individual's differences with an irrational or an unbiological social norm.

The psychiatric emphasis of the work is eclectic. Its most important teachings are the diversity of the causes which operate to produce delinquency in different persons, the need for caution in classing delinquents as insane, and the reconciliation of theory with administration. The sections on the psychiatry of punishment are less documented, and more dependent on assertion, than the psychological sections: it is to be hoped that the author will amplify his conclusions in a later work. It would be particularly desirable to have statistical evidence in support of his contention that imprisonment, as it exists today, may be of value in stabilising certain psychopathic personalities. His insistence on the factual test of theory, and on a unified and unprejudiced study of data, is of particular value at the present time: his impatience with utopians and propagandists may lead him to overrate the wisdom of society, or the merits of the State, but his humanity and his responsible attitude to his material are considerable compensations for this. As an apologia for the work of punitive psychiatry, the book is an able though by no means a complete rejoinder to modern criticism: as the product of a lifetime of psychiatric experience, it is a work from which no serious student can fail to profit.

Minor Surgery

(2nd ed.) Editors: Sir HENEAGE OGILVIE, D.M., M.CH., F.R.C.S.; WILLIAM A. R. THOMSON, M.D.; with an introduction by Lord WEBB-JOHNSON, P.R.C.S. London: Eyre & Spottiswoode, for the *Practitioner*. 1949. Pp. 192. 14*s*.

THIS is a revised edition of one of the *Practitioner* Handbooks, first published in 1943 as a collection of articles on minor surgery which had appeared in that journal. The changes now made are largely due to the advent of penicillin, and there is a new chapter on strains and sprains by Mr. G. R. Girdlestone. A review is no place to embark on a discussion of the proper field of minor surgery; suffice it to say that the attitude here adopted is that necessarily implied by a group of noted specialists writing on their own subjects with authority—and in some cases with deep feeling, as when Mr. H. W. S. Wright insists on the importance of never allowing a minor surgical procedure in childhood to inflict a major psychological trauma. In the result

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we have a series of essays detailing the less formidable aspects of a number of surgical specialties; and since these happen to be just those aspects that most concern the comfort, and often (as in the hand) the everyday function, of the patient, they are also some of the most important. This book emphatically should not be regarded as a jog to the general practitioner's elbow; rather is it meant to show him just what specialists can do for his patients in a restricted field, for the sections dealing with infections of the hand and the treatment of talipes are obviously not meant for the surgery. With the matter of the book there is little to quarrel; but what justification is there in 1949 for advocating the barbarous practice of giving "a good purge" to the patient suffering from recently inflicted wounds?

Traitement chirurgical de l'hypertension artérielle

MAURICE LUZUY and JEAN F. PORGE. Paris: Doin. 1948. Pp. 160. Fr. 500.

THE surgery of hypertension and its complications has not yet been stabilised; opinions vary both about the suitable case and the suitable operation. Before discussing the physiological and pathological factors, this book reviews the history of the condition, from the recognition of Bright's disease up to the introduction of surgical procedures, and then devotes chapters to diagnosis and special tests. The division of hypertension into three forms—essential (neurogenic), endocrine, and nephrogenic—simplifies the choice of operation considerably. Various nerve operations are described and illustrated, and the postoperative treatment is detailed. The indications for resection of the suprarenal gland, and the association of suprarenal tumours with hypertension, are recorded, and the possibilities of surgery in renal hypertension are surveyed. This monograph is comprehensive and the opinions well expressed. There are some illustrations and a limited number of references.

Atlas of Neuropathology

WILLIAM BLACKWOOD, M.B., F.R.C.S.E.; T. C. DODDS, F.I.M.L.T.; J. C. SUMMERVILLE, A.I.M.L.T. Edinburgh: E. & S. Livingstone. 1949. Pp. 199. 35*s*.

THIS well-illustrated atlas meets a need in the education of the young physician. Knowledge of the specialised field of neuropathology usually calls for work in special laboratories and much personal tuition. Most clinicians simply have not the time for this, and therefore tend to learn their neurology without the background of pathology which is fundamental to rational diagnosis. With his technical colleagues, Dr. Blackwood has collected and photographed specimens and microscopical sections of all the common conditions and some of the rare ones, and these are used to illustrate the morbid processes that occur in the nervous system. They have limited description admirably, so that there is just enough information to orientate the student as he studies the atlas. The subject is presented so plainly and so simply that the initiated might complain of over-simplification; but the compilers are wise in subordinating the natural enthusiasms of the specialist to the mundane requirements of the ordinary student. There are 262 photographs and diagrams, some of them coloured and all good.

Introduction to Group-Analytic Psychotherapy

S. H. FOULKES, M.D., associate chief assistant, department for psychological medicine, St. Bartholomew's Hospital, London. London: Heinemann Medical Books. 1948. Pp. 181. 21*s*.

Dr. Foulkes is one of the pioneers of group psychotherapy, and this account of his work has been eagerly awaited. Methods of treating psychological patients in groups vary greatly, and, as the title indicates, he favours one based on psycho-analytic thought. But he reserves the purely analytic approach for individual treatment, and conducts his groups on lines that represent a mixture of psycho-analytic and "supportive" measures, this support consisting in guidance and in admonishing and reassuring remarks and actions. It is this admixture of "support" that will evoke difference of opinion among psychotherapists. Many of them (e.g., Bion and those stimulated by his work) believe that the more analytic the approach, the fewer the casualties. Dr. Foulkes's own experience of patients who attend his groups only once and stay away, in spite of reassurance, can be held to strengthen this view. The therapist's active interference, which at first sight looks like a helpful measure, must also, in the long run, be disturbing: does not the therapist confirm the patients' deeper fears when he acts in a "punishing" way—for example, by removing difficult patients from the group? Everybody who has seen groups will agree with Dr. Foulkes that "belonging to a group" is the most powerful supportive agent known at present, and that great use can be made of this fact in group psychotherapy. What is questionable is whether group analysis can be combined with supportive group therapy. It must be said, of course, that group methods are still in their infancy, and our understanding of the often very complex group phenomena is still too incomplete to allow any definite judgment.

Schafer's Essentials of Histology (15th ed. London: Longmans, Green. 1949. Pp. 655. 25*s*.).—The new edition of Schafer, edited by H. M. Carleton and E. H. Leach, maintains its comfortable air, its pages and pages of pictures, and its ample descriptions of cells in all their forms and activities. Some of the older pictures are getting dark, and are further robbed of brilliance by the gloomy shade of current paper; but how good they prove on study: they all show exactly what they set out to show. Can nothing be done to smarten up the looks of this fine old work?

The Therapy of the Neuroses and Psychoses (3rd ed. London: Henry Kimpton. 1948. Pp. 642. 32*s*. 6*d*.).—In this edition of his "socio-psycho-biologic analysis and resynthesis" Dr. S. H. Kraines has added a useful chapter on "psychiatric geriatrics"—perhaps the forerunner of psycho-socio-gerontotherapy—but has retained almost unchanged from the 1943 edition a lengthy chapter on neuro-psychiatric states in war-time. A useful innovation is the appendix containing statistical tables of mental disorder, epilepsy, and defect in the United States during 1944.

Physical Signs in Clinical Surgery (11th ed. Bristol: John Wright & Sons. 1948 and 1949. Pp. 426. In four parts. 8*s*. 6*d*. per part.).—The new edition of Mr. Hamilton Bailey's book appears in four paper-covered parts—a pity for those who, like Chaucer's clerk, enjoy the presence of "bookes, clad in blak or red." But the content matters more than the binding, and the author's preface must disarm criticism on this point. Mr. Bailey has again exercised his genius for medical illustration in improving what seemed already perfect. A comparison of this edition with its predecessor shows the care exercised in adding colour, altering size, or replacing good pictures with better.

Death be not Proud (London: Hamish Hamilton. 1949. Pp. 212. 7*s*. 6*d*.).—Mr. John Gunther, author of *Inside Europe*, had a son, Johnny, who died, aged 17, of a glioma of the right occipital lobe, fifteen months after the first specific symptom. This is his father's account of the boy and of these fifteen months, with a footnote by his mother and some of the boy's own notes and letters. Mainly it reviews the illness as seen by the parents, devoted, but already divorced. Much will be familiar to many doctors—the silent onset, utterly evading routine general and ophthalmic examination (he even had a routine B.M.R.), the amazement of the modern-minded parent at the limitations of our much-vaunted medical science, the inevitable appearance of the unorthodox practitioner, "attacked by the massive vested interests in medicine," the tragic fallacy of that irresistible argument "there is absolutely nothing to lose," and the heartbreak of trying to mix "unorthodoxy" with medicine and surgery. All these we know, though scarcely in their transatlantic form; "and the doctors! We had thirty-two or thirty-three—maybe more." The boy, keen, intellectually gifted, and supported by a mother with a true zest for life and sense of spiritual values, pursued his studies, through remissions and relapses and through every conceivable diagnostic and therapeutic procedure, heroic operations, and even a rigorous diet, passing examinations with distinction a few weeks before his death. For his father, "the ego itself" can be "killed by an evil growth"; his mother shows herself no such materialist. Perhaps she chose Donne's fine poem which gives the book its title.

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THE LANCET

LONDON: SATURDAY, JUNE 18, 1949

Cuts and Charges

THOUGH many disputed its application, few decried the principle underlying the National Health Service Act—namely, that the cost of medical treatment should not be a charge on the individual patient's purse. When the service started, it was perhaps forgotten for a time that a burden shared is still not a burden dispelled; but the Chancellor of the Exchequer [1] apparently holds that the £260 million per annum which the taxpayer is now paying towards the service is about as much as he can bear. It was no doubt under Treasury pressure that the Minister of Health called last March for large cuts in the estimates of hospital expenditure [2]: according to the Select Committee on Estimates (whose report is summarised elsewhere in this issue), these averaged in England and Wales 8% for the teaching hospitals and 5% for the others. The hospital boards' response to the cuts was to say that development would be arrested and existing services might be jeopardised; and, since this was generally true, we are very glad to know that the Minister has now told them that, though they must exercise the strictest economy, they need not necessarily keep within the total notified. He relies on them "to budget only for services which they are satisfied *must* be brought into operation during the current financial year"; but they are to allow for developments now in progress, for the cost of reopening unstaffed beds or of other urgently needed additional facilities, and for recommended wage increases. Though, however, this welcome instruction relieves immediate anxiety, it does not alter the plain fact that the service is likely to obtain in future not what it needs but what the Treasury can offer, taking into account the cost of national reconstruction, of armaments, and of the other social services.

With strict limitation of their funds, those who administer the N.H.S. will have to answer important new questions. In particular they ought to review the distribution of resources between the general-practitioner and the hospital services, bearing in mind that inefficiency in either branch tells hard on the other. Nobody denies that hospitals must be maintained, but it is equally clear that they provide a relatively expensive form of medical care which should not be wasted on those who do not require it. Ought not the centre of gravity of a Health Service gradually to shift towards good general practice rather than away from it? The high policy of the service demands, indeed, more thought than, in the turmoil, it has ever had; and we should be glad to hear that the Central Health Services Council, from which so much was hoped, is not only alive but also alive to the big issues. For the moment, however, the question is mainly where economy can least harmfully be exercised. In some respects expenditure has hitherto been controlled with a comparatively loose rein. In the pharmaceutical services, for instance, considerable saving could no doubt be effected by adhering to the new *National Formulary* wherever it offers a suitable prescription. In the ophthalmic services, according to the Select Committee on Estimates, saving would result from a fuller system of control, to prevent abuse; and the same may be true of appliances other than spectacles. As regards remuneration, the fact that some workers in the N.H.S. are now being overpaid should not obscure recognition that others—notably some groups of general practitioners and perhaps some of the specialists who have not been recognised as consultants—are being underpaid: we fully share the opinion of a correspondent who writes: "I regard this service as necessary, but I have always held that its introduction ought not to leave anybody appreciably worse off, change his standard of life or the education of his children, or drive him out of his home." On balance no saving is possible on medical remuneration; indeed, unless inequity is to be perpetuated or resources in talent depreciated, this item will have to rise substantially. As to hospitals, some ways in which clinicians might help to reduce costs were indicated to the International Hospital Federation by Dr. C. T. MAITLAND, whose remarks are reported on another page. For want of a suitable uniform costing system, hospital accounts are in a sorry state. Though some can tell the cost of each occupied and unoccupied bed, few can declare in detail their departmental expenses. Yet this is vital information, and until facts of this sort are known it will be difficult to compare costs and to detect wastage.[2] Possibly the internal audit system practised in Scotland and applauded by the Select Committee could help to bring light into dark places. The risk of course is that, as the figures become known, the lowest will be acclaimed as a universal optimum, whereas in teaching hospitals and places of research or innovation they may be almost irrelevant.

The public might be readier to play their part if everybody understood that only a fraction of his National Insurance contributions goes to the upkeep of the service, and that contributions from this source cover only one-ninth of the total cost. Introducing the Budget last March, the Chancellor reasoned that there was good cause—though not immediate—for imposing some charge or tax in connexion with the health services, both to bring home the fact that they are paid for from taxation and to help to meet the cost. The principle that the Government should subsidise medical care rather than pay its whole cost still has powerful support outside Parliament: the British Dental Association clings to it; and now the Joint Emergency Committee of the optical profession [3] is said to have proposed to the Ministry of Health that it should be applied to the ophthalmic services. From another angle Sir RONALD DAVISON [4] has argued that patients should be charged a lodging fee during their stay in hospital. To such charges there are

1. *Lancet*, April 16, p. 659.
2. See leading article, *Ibid*, March 12, p. 443.
3. *Evening Standard*, June 11.
4. *Lancet*, May 7, p. 797.

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theoretical and practical objections—notably that they would involve reintroduction of a means test, whose disappearance is one of the pleasantest features of the new service. However, there is such a thing as *reculer pour mieux sauter*, and within the next year or two the objections will have to be measured against the harm that can be done to the service, both in efficiency and in spirit, by sheer lack of money.

Safety in the Swimming-pool

FOR an island nation we are not as aquatic as we might be, and the proportion of swimmers among those who disport themselves on our summer beaches often seems regrettably small. The remedy is to teach swimming at school, which usually means that the children must have access to a public or private swimming-pool. The number of these was increasing steadily before the war and will, we hope, do so again, particularly for the use of urban communities whose opportunity for other sports is scanty. But swimming-baths have come under serious suspicion as foci for the spread of various infections from plantar warts to poliomyelitis, from otitis and "pink-eye" to typhoid and dysentery. With a heavy load of bathers and a rapid turnover on a warm summer's day the water inevitably becomes contaminated with bacteria of human origin, some of which may be pathogenic. Even with the most careful control, potentially dangerous nasopharyngeal or bowel micro-organisms may be transferred from one bather to another by close propinquity. The risks, however, will be small if a high standard of bacterial cleanliness of the water is maintained.

The methods commonly used for keeping the water clean are filtration, usually combined with coagulation of particulate matter, aeration, and disinfection; and the system of continuous circulation of the water supply is preferable to the fill-and-draw method which is more likely to allow the accumulation of bacterial contaminants. The purity of the water is usually assessed by both chemical and bacteriological tests, and it is the duty of the bath superintendent to see that these tests are regularly and efficiently performed and correlated. As chlorine in one form or another is the most common disinfectant used in swimming-baths, the chemical analysis, usually done on the spot, is mostly concerned with the estimation of residual chlorine, but it is advisable to test also for free or albuminoid ammonia which affects the rate of destruction of bacteria by chlorine or other oxidising agents. Bacteriological control consists in determining the coliform and sometimes total bacterial count in samples of water taken into sterile receptacles containing sodium thiosulphate to neutralise the chlorine. The sample should preferably be packed in ice and transported to the laboratory as quickly as possible. There are no bacteriological standards laid down for swimming-bath water, but the incoming water should have the purity of drinking-water (less than 1 *Bact. coli* per 50 ml.) and samples of the bath water should not contain more than 2 coliform bacilli per 100 ml. or a total of 200 bacteria (at 37°C) per ml. In the Public Health Act (1936) local authorities are empowered to make by-laws regarding the purity of water in swimming-pools, and the Model By-laws (1939) recommend that when "disinfection is effected by means of chlorination, there must at all times be present in the water not less than 0·2 parts and not more than 0·5 parts per million of chlorine." Disinfection by chlorine is dependent on the concentration of residual chlorine, the temperature of the water (a reasonably high temperature favouring bactericidal action), the pH (better in an acid than in an alkaline medium, although for other reasons the optimum pH lies between 7 and 8), and the amount of organic impurities derived from bathing costumes, perspiration, urine, &c. When the free ammonia, representing organic impurities, reaches 2 or 3 p.p.m. it is hard to maintain the residual chlorine at a level of 0·2 p.p.m. unless the water is frequently changed, which is difficult in these days of fuel economy. An alternative method of maintaining an effective bactericidal action which is rapidly gaining favour is "breakpoint chlorination." When chlorine is added to water with a fair content of ammonia there is at first an increase in the residual chlorine, followed by a fall until a point is reached when a further addition of chlorine causes a rise again. There is thus a typical curve with a hump and a dip, and breakpoint chlorination consists in applying a dose of chlorine just beyond the dip. The amount of chlorine required to reach the breakpoint is usually about ten times the amount of free ammonia with which it unites to form chloramine. The advantages of breakpoint chlorination are that sterilisation is more rapid and complete, the bactericidal activity being due to hypochlorous acid and not, as previously, to some dubious form of chloramine; impurities are oxidised, so that the clarity and sparkle of the water is considerably improved; and, rather surprisingly, the free residual chlorine is not irritant to the bather, even when the concentration exceeds 2 p.p.m., though the atmosphere of an indoor bath may irritate the conjunctivæ of those staying in the place for some hours.[1] From the viewpoint of safety there is an obvious advantage in being able to maintain the residual chlorine level at 1–2 p.p.m., since not only bacteria but also certain viruses—e.g., that of poliomyelitis—will be quickly destroyed at such a concentration.

A different method of purifying swimming-bath water is ozonisation, in which electrically produced ozonised air mixes with the inlet water in a proportion of 1 : 1 to 1 : 3, according to requirements. With a concentration of 0·1 p.p.m. of ozone in pure well water, HOATHER and LAWS[1] found a very rapid kill of coliform bacilli—from approximately 1600 per 100 ml. to 25 and nil in 5 and 10 minutes respectively. This method of sterilising water is free of any irritant effect on mucous membranes but is expensive to install and maintain, and as the ozone is rapidly absorbed by organic impurities and removed by agitation and aeration its efficiency in heavily loaded pools might be open to question. The method is used in some swimming-pools in this country and more extensively on the Continent, and no doubt the technique of ozonisation is susceptible to improvement. The use of ultrasonics for the sterilisation of water is also a future possibility. Meanwhile the services of the engineer, the chemist, and the bacteriologist could be more fully utilised to ensure that our

1. Hoather, R. C., Laws, G. J. *J. R. sanit. Inst.* 1949, 69, 219.

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public swimming-baths are kept free of unnecessary risk to the bathers. Unfortunately many pools in schools, colleges, and clubs come under no proper public-health control, and doctors responsible for the health of young people using such private pools should see that they are not liable to spread infection through lack of hygienic supervision.

Two Pillars of Wisdom

THE complicated structure of university education rests on three pillars: selection, awards, and training —picking students, paying for them, and teaching them. P.E.P. have lately investigated the first two of these. In their report [1] they assess the earlier study by the Working Party on University Awards,[2] observing with regret that the Working Party was obliged to accept the status quo as the foundation of new proposals. This criticism is directed to disparities in the scale of awards and to the anomalous division of responsibility between universities and local education authorities. More generally P.E.P. contend that awards and selection, which are closely linked in practice, should not be considered separately. (The Working Party's report suggests that they themselves would have preferred a wider reference. They have indeed stretched their brief at one point to accommodate a recommendation—concerning a clearing-house for applications—that has its origin in the problem of selection.)

P.E.P., with a freer rein, put the basic question in these terms: "(1) How many university places is it the policy of the universities and the State to fill? (2) How many of these places can or should be filled by students who can pay their way? (3) Should the system of awards be used to attract the right numbers of students into the universities and to direct them into particular branches of study related to the needs of the nation? (4) How are students to be selected and who should make the awards?" As might be expected, much of the discussion concerns the second of these. "It is important," say P.E.P., "that there should be no doubt that the standard of admission should be the same for fee-payers as for scholarship holders." This has been argued at some length and with some heat in the *Times*, the contestants differing mainly on the extracurricular merits of the fee-payers. Sir ERNEST BARKER [3] and Lord ELTON,[4] for instance, have thought that the diversity of the student population would be endangered if fee-payers were excluded unless they conformed to the same entrance requirements as their colleagues. But even the principle of diversity has to be administered with discretion; no-one would wish to use it to justify relaxation of existing standards of intellect and character. If it is argued that a desirable diversity is prevented by the narrow academic standards in allocating scholarships, the remedy surely lies in broadening these standards to take account of the further qualities which are esteemed in fee-payers. The fees cover only a small proportion of the cost of education; fee-payers are, in fact, already heavily subsidised by the State or by former benefactions. If, however, preference is not to be given to those who can pay their way, there seems to be no sufficient reason for asking this group to pay anything at all. P.E.P. refer to "the difficulty of the professional classes, at current costs and taxation levels, in paying £200–300 a year for each child at a university." To remit fees entirely, it is estimated, would cost little more than £1 million a year; but maintenance grants for all would probably cost at least a further £17 million a year—a burden which is unlikely to be assumed at present. Whatever the arguments from principle, expediency is likely to dictate for the immediate future.

As regards selection, which is described as "the crux of the whole problem," the writers comment favourably on the Working Party's recommendation that a university clearing-house be set up to deal with applications. The objectives are twofold: the first is "to assist in the exchange of information about the number and spread of applications; and, after the universities had decided on their admissions, to sift the candidates who had been rejected, in order to find out how many unsatisfied candidates remained"; the second—and more controversial—is to achieve a reasonable uniformity in standards of admission. There is no real doubt that the final sifting of candidates for admission will continue to be done by a personal interview, though there is room for improvement in the detail of interviewing methods. The main difficulty lies in adjusting the relative numbers of candidates and interviewers so that a reasonable length of time may be allowed to each candidate. This might be achieved by increasing the interviewing staff or the time that each member gives to this work (though this hardly seems feasible with the staffing ratios), or by diminishing the numbers to be interviewed. Whether mental tests or entrance examinations are likely to help is already the subject of research. A fuller use of information available from school records will also need to be considered. It is doubtful, however, whether the more elaborate procedures, as used for instance by the Civil Service Selection Board, which the Working Party was inclined to favour, will prove valuable enough to justify their cost in time and money. The proposed clearing-house proposal might be employed as a screening mechanism, with criteria based not on merit but purely on such geographical restrictions as the universities might impose (many already give preference to local applicants) and on limitation of the number of applications that would be considered from one candidate. The difficulties of the proposal, some of which were ably presented by Mr. W. W. GRAVE, PH.D., in a dissentient note to the Working Party's report, cannot be properly weighed without more information. The same purpose might possibly be achieved by private arrangement between colleges or universities which have a large number of applicants in common. So far as the medical schools are concerned, M.R.C. investigators have already begun a survey [5] which will show how applications are at present distributed and how far the number dealt with by each medical school could be reduced.

1. The University Student: Selection and Awards. Political and Economic Planning, 16, Queen Anne's Gate, London, S.W.1. 1949. 2s.
2. University Awards: Report of the Working Party on University Awards. H.M. Stationery Office. 1948. 9d.
3. *Times*, May 7.
4. *Ibid*, May 16.
5. Harris, A. D. *Lancet*, 1948, ii, 317.

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Annotations

SUPRARENAL HORMONE IN RHEUMATOID ARTHRITIS

THE International Congress on Rheumatic Diseases, held in New York at the beginning of this month, heard further news of the treatment of rheumatoid arthritis by 'Compound E,'[1] or 'Cortisone' as it has now been renamed. Dr. Walter Bauer, of Boston, held that it might prove "the most significant discovery of our generation," having in mind no doubt the far-reaching implications of the discovery for general medicine. A correspondent who attended the meeting, at which over 1000 people were present, says that a great ovation was given to Dr. Philip S. Hench, of the Mayo Clinic, who with Dr. Edward C. Kendall, the clinic's biochemist, developed this treatment. Our correspondent adds: "It is a most wonderful thing to see; in a few hours effects are produced in apparently completely crippled patients."

An account in the *New York Times* of June 5 makes it clear that pituitary adrenocorticotropic hormone is as effective as cortisone, though both are so scarce that even Dr. Hench and his colleagues are finding difficulty in establishing the proper dosage and learning about side-effects. The latter include rounding of the face, hirsuties (mainly affecting the face), and heightened adrenal activity. Moreover, the weight may increase by as much as 4 lb. per day; this is largely due to water retention, but the diet has to be restricted because, left to themselves, patients consume as much as 6000 calories a day. Euphoria is very noticeable, and Dr. Hench believes that the hormone may have a place in the treatment of psychiatric cases, though he himself proposes to investigate next its effect in rheumatic fever.

According to our correspondent, a certain amount of cortisone may be available for some research institutions early next year; even in 1950, however, there will not be enough for general use. The *New York Times* observes that a three-week course costs $18,000, and apparently the treatment has to be continued throughout life. However, the cost will doubtless come down as commercial production increases; and an intensive attempt at synthesis will be made.

1. See *Lancet*, April 30, p. 744; *Ibid*, May 7, p. 786.

MIND AND MECHANISM

AT what level in the animal scale can we first recognise mind? In his Lister oration at the Royal College of Surgeons last week Prof. Geoffrey Jefferson, F.R.S., recalled J. Z. Young's demonstration that an octopus will develop neurotic responses to puzzling situations and remarked that "the child confused by its teachers, and unable to grasp the logic of its lessons, is but a more complex example of the puzzled octopus." He thought it likely that the number of synapses in a nervous system is the key to the possible variations in its behaviour. But neither animals nor men can be explained by studying nervous mechanics in isolation—if only because thought is coloured by emotion. When all is said, "we emerge with the conviction that although much can be properly explained by conditioned reflexes and determinism (in which idea mechanism lurks in the background) there is a fringe left over for free will, a fringe that becomes larger and larger the more complex the nervous system."

Today, said Professor Jefferson, we are being gently pushed to accept the likeness between the actions of electronic machines and those of the nervous system. But the electronic computing machine, making a choice between "yes" and "no" at a great number of points with the speed of electricity, works thousands of times faster than the human brain. "The flashing speed of thought which so much impresses us is, it seems, a rather slow affair." The fastest known nerve impulses in mammalian nerve or spinal cord travel at about 140 metres per second, which is far less than the normal speed of electricity (1000 feet per microsecond); and, though nervous impulses are accompanied by changes in electrical potential, we cannot yet be sure that they are themselves electrical. (Examined in another way they appear chemical; and there may yet be other methods of investigation.) Moreover, if we observe that some nervous tissues behave like some electronic circuits we must remember that the resemblance is to fragments of the nervous system and not to the whole. We cannot be sure that the highest intellectual processes are carried out in the same way as the lower: "abstract thinking may not be a matter of synapses, axons, and *boutons terminaux*."

Computing machines, Professor Jefferson continued, use far fewer neurones than we have in our brains.

"One may compare the 10,000 million cells of Adrian's estimate with the 20,000 valves of the first big American machine ENIAC at Princeton,[1] and the 1000 of Prof. F. C. Williams's newer and more efficient experimental instrument in Manchester.[2] McCulloch of Chicago estimated that a model that contained valves and wiring anything approaching in number the neurones in the human nervous system would require a building the size of the Empire State Building to house it, and the complete electrical output of Niagara Falls to run it."

The analogies between these machines and the brain—they are no more than analogies—lie in certain likenesses between wireless valves and nerve-cells. Thus the valves can be wired so as to store messages and to show the Sherringtonian principles of "convergence" and "divergence"; they can be inhibited from action; and they may be arranged so as not to transmit a message (a symbol in terms of electricity) unless they are receiving impulses from several other valves. "The likeness between such an arrangement and that of the impulses arriving in a nerve-cell through its dendrites is so close as to convince us that in these actions nervous tissues with simple neuronal patterns behave extremely like some electronic circuits." The fact that calculating machines can be made to store electrical charges (representing numbers) for long periods suggests that there is "memory" in the machine, which, if it is to proceed with a calculation, must "remember" how far it has already gone.

"We are invited to consider that the memory that the machine has in the form of stored charges is perhaps the same as memory in man or an animal, as a 'charge' in a cell or a group of those millions of cells whose individual uses we do not know. All that one is entitled to say is that it could be something of that kind, but that the electrical machine offers no proof that it is so."

It is, however, through the use of words, for conceptual thinking as well as expression, that man's mind has outdistanced those of animals, and the lecturer found it hard to imagine a machine that could not only use words but also create concepts and find for itself suitable words in which to express additions to knowledge that it brought about: failing this, "it would be no more than a cleverer parrot." He ventured to predict that "electric brains" will never be made, and that the day will never dawn when the premises of the Royal Society will be turned into garages to house the new fellows.

"No mechanism could feel (and not merely artificially signal) pleasure at its successes, grief when its valves fuse, be warmed by flattery, be made miserable by its mistakes, be charmed by sex, be angry or depressed when it cannot get what it wants. Thinking is so saturated with emotion that one does not exist without the other. I conclude, therefore, that although electronic apparatus can probably parallel

1. See *Lancet*, 1946, ii, 795.
2. See *Times*, June 11 and 14.

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some of the activities of nerve and spinal cord and may assist us in understanding better the transmission of the special senses, they still do not take us over the blank wall that confronts us when we come to explore human thinking, the ultimate in mind. Nor do I believe they will do so. What I fear is that a great many airy theories will arise in the attempt to persuade us that we know more than we do. We have had a hard task to dissuade men from reading qualities of human mind into animals. I see a new and greater danger threatening—that of anthropomorphising the machine."

Professor Jefferson admitted that discussion of brain-mind relationships is premature; he suspected that it would always be so. But he took heart from Hughlings Jackson, who wrote:

"It is a favourite popular delusion that the scientific inquirer is under a sort of moral obligation to abstain from going beyond the generalisation of the observed facts, which is absurdly called 'Baconian induction.' But anyone who is practically acquainted with scientific work is aware that those who refuse to go beyond fact rarely get as far as fact; and anyone who has studied the history of science knows that almost every great step therein has been made by the 'anticipation of Nature,' that is, by the invention of hypotheses, which, though not verifiable, often had very little foundation to start with."

The real method of scientists (K. J. W. Craik said) was to see whether some idea can be substantiated by experiment. The so-called laws of science had generally no very tidy beginnings: "they are no more than science recollected in tranquility." We must beware, therefore, of making science too rigid, self-conscious, and pontificial. "A. N. Whitehead confessed to me once that he had escaped from the certainty and dogma of the ecclesiastics only in the end to find that the scientists, from whom he had expected an elastic and liberal outlook, were in the end the same people in a different setting."

ANTABUSE IN ALCOHOLISM

AT the end of last year Martensen-Larsen [1] reported results in 83 cases of alcoholism treated with 'Antabuse' (tetraethylthiuramdisulphide). This drug sensitises the patient in such a way that even small doses of alcohol give rise to unpleasant reactions, which are attributed to the formation of acetaldehyde in the body.[2] In this as in his earlier paper [3] Martensen-Larsen emphasised the need to supplement such treatment by other means, and he made no attempt to disguise the discomforts, including tachycardia and nausea, that it provoked. Subsequent reports in the Scandinavian medical press are rather fragmentary, but it is stated [4] that antabuse is being tested on a large scale throughout Scandinavia, and that at any rate 4 fatalities have been recorded. In all these cases, however, post-mortem examination gave good grounds for exonerating the drug, which had been given to patients with undetected diabetes or with other serious ailments. Severe urticaria has been reported,[5] and an alarming account [6] has been given of a fall of blood-pressure from 130/100 to 70/0 mm. Hg in an alcoholic patient, aged 34, who suffered from pulmonary tuberculosis. (He recovered after intramuscular injections of a stimulant.) Another report [7] deals with the problem from the social rather than the clinical angle: it is the record of a workman, born in 1886, who between 1910 and 1947 was continually in and out of gaol because of alcoholism and its sequels. In such cases, it is argued, the community is surely justified in confronting the offender with the choice of internment or accepting antabuse treatment.

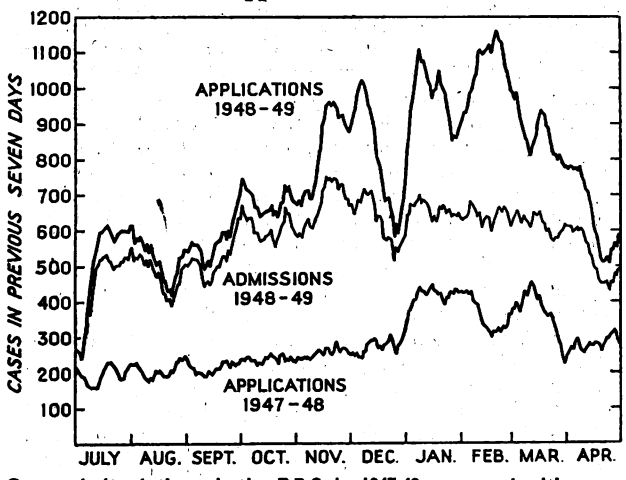
1. Martensen-Larsen, O. *Lancet*, 1948, ii, 1004.
2. Hald, J., Jacobsen, E. *Ibid*, p. 1001.
3. Martensen-Larsen, O. *Ugeskr. Laeg.* Oct. 21, 1948.
4. Editorial, *Ibid*, Feb. 24, 1949.
5. *Ibid*, Jan. 13.
6. *Ibid*, March 17.
7. *Ibid*, Jan. 27.

The Scandinavian man in the street seems to be taking as lively an interest in this subject as the Scandinavian medical profession, with the not inconsiderable risk that the issue of the controlled experiments now being carried out may be obscured.

CALLS ON THE LONDON EMERGENCY BED SERVICE

A YEAR ago the Emergency Bed Service in London was considering, not without anxiety, how best to prepare for the first winter of the National Health Service. Would there really be some vast increase in the patients demanding urgent admission to hospital, or would the number be much as before? A considerable increase was certain because the E.B.S. had agreed to take over the admission of infectious fevers, which had hitherto been outside its compass. Preparations were made on a scale that it was hoped was neither extravagant nor inadequate, and in due course July 5 came. At once there was a tremendous rush of applications. As the chart shows, this fell away in two or three weeks, and it was evident that it had been partially caused by exuberant doctors who either extravagantly welcomed or loathed the new Health Service and for opposite reasons thought the moment had come to put forward every possible case. Thereafter the E.B.S. was left with a formidable increase on its previous work, due mainly to an alteration in procedure in ex-municipal hospitals. These had hitherto themselves sought for beds in other hospitals when they were unable to admit a patient, whereas after July 5 they referred the patient's doctor to the E.B.S. This change had been foreseen, but its scale had not been anticipated.

From July 1, 1948, to April 30, 1949, the E.B.S. received 45,682 applications for admission to hospitals in the Metropolitan regions; of these 10,926 were infectious cases, all of which were admitted without undue trouble. By August things had settled down and it was possible to gauge what the volume of work would be in the winter. The numbers were about four times what they had been in previous years, but it was impossible to say whether more patients were being offered to the hospitals or whether it was only that the method of approach had been altered. The winter's work is best described by the chart. From November onwards the E.B.S. daily admitted to hospitals all the patients they could take, and there were always some for whom a bed could not be found. Thus the number of applications and the number of admissions ceased to bear any relation to each other. In looking at the chart, however, it should be borne in mind that 10–12% of all applications are withdrawn for various reasons by the applicants; so a gap of this extent between the applications and admissions curves



Cases admitted through the E.B.S. in 1947-48 compared with cases submitted in that year and in the previous twelve months.

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may be looked on as unavoidable and satisfactory. Nearly all the patients who could not be admitted were old people—i.e., 60 and over—with "acute-on-chronic" ailments, mainly medical, which had often failed to get into hospital in previous years. Whether there were more or less of them last winter it is impossible to tell. Cases of this type were seldom offered to the E.B.S. before July 5; only their local municipal hospital would take them, and if that hospital refused it was idle to try elsewhere. A few for whom no bed could be found were referred to the E.B.S. in the winters of 1946 and 1947, but now all inevitably sought admission through the E.B.S., and their numbers in Greater London could be estimated for the first time.

Such a situation was expected, and many had feared that it would be worse than it proved; indeed, but for the abnormally fine winter it probably would have been worse. At the same time it must be remembered that, broadly speaking, all patients under 60 were admitted. Much thought is being given to the reorganisation of the E.B.S. before next winter so that the delays which took place in either finding a bed or ascertaining that there was none may be reduced.

WARD SISTERS IN THE MAKING

MANY of us remember a moment of terror when we saw our names on the list of those successful in the final examination. Gone were the pleasant months of practice under a senior: from now on we were to rely on our own judgment and to answer for our own mistakes. For the nurse that cold moment probably comes not when she qualifies but when she takes up, for the first time, the full responsibilities of a ward sister. King Edward's Hospital Fund for London has for some time planned a staff college for those about to become ward sisters to help them to find their feet; and this has now been opened at 147, Cromwell Road, London. If the Fund entertained any doubts about the success of the scheme they should have been allayed by the number of applications received: 60 prospective ward sisters applied for the 25 places for the first course. The candidates are drawn only from the Metropolitan regions, and those accepted have come from various types of hospital—large teaching hospitals, other large hospitals formerly municipal, and small hospitals, some formerly voluntary and some municipal; two come from midwifery training schools.

The college, once a private hotel, is light, roomy, and agreeably furnished. The students have their own rooms, each with its own gas-fire, and hot and cold water; there are comfortable sitting-rooms and dining-room, and a splendid library with (as yet) very few books. Catering is in the hands of a lay warden, Miss M.I.M. Seivewright, who has had a domestic-science training and has also taken the Fund's course for hospital domestic supervisors. Rules are trifling, and relate only to the comfort of all; each student has her own key and the hours she keeps are her own affair.

The four-month course is arranged by qualified nurses: Miss A. M. Downer, the principal, is a St. Mary's nurse with experience as a matron, and Miss C. H. S. Dobie, the tutor, is a St. Thomas's nurse who has held posts as sister-tutor and assistant matron. They have brought a happy research spirit to the task and have planned the first course on frankly experimental lines. The three aims are to help the students to achieve good personal relations with their staff, and to teach them how to teach and how to administer a ward. The students spend the first 7 weeks at the college, partly on theory, and partly on visits to such places as a reablement centre, a law-court, a well-equipped and up-to-date hospital, a home for incurables, a sanatorium, a mental hospital, and the Ideal Home Exhibition. Each student has a day with an almoner in her office, and a day with a district nurse on her rounds. Their lectures have been on such things as the proper use of clerical staff, the interpretation of pathological reports, teaching, personal relations, cross-infection, and even flower arrangement. Many talks have been given by experts drawn from outside, and some subjects have been covered from many angles. Personal relations, for example, have been discussed in the course of their lectures by a psychologist, a matron, a district nurse, and a caterer. The views of the student nurse on this topic have not been placed before the class, but most of them are young enough to recall these clearly: their average age is just over 27, and the youngest is 24. They are not encouraged to take formal notes, and much of the work is done by free discussion, in which the warden often joins, putting the viewpoint of the layman, and sometimes of the patient. The next 6 weeks of the course are spent in various hospitals, each student working with an experienced ward sister, and returning to the college on two evenings a week for discussions. Nurses from former municipal hospitals are sent, for three weeks, to teaching hospitals, and nurses from former voluntary to former municipal hospitals. In the second three weeks of this period each student goes to a good hospital of a similar type to that in which she is about to take a sister's post. Students have been warmly received by the sisters in all these hospitals, and have valued this practical experience greatly. The last fortnight of the course is spent at the college in further lectures and discussions. The plan has been tried, in this first course, of dividing the students into three groups in which those of widely different background and experience have been mingled. Each group has been asked to produce a manual for ward sisters; and at the end it is intended to compile a single manual of which copies can be taken away.

This very lively project of the Fund should do much to raise our nursing standards to a high general level.

BIRTHDAY HONOURS

THE honours announced on His Majesty's official birthday, June 9, include one borne by no other member of our profession: Sir John Weir, G.C.V.O., consulting physician to the Royal London Homœopathic Hospital, who has been a physician-in-ordinary to the King since 1937, receives the Royal Victorian Chain. Lieut.-General Cantlie, who last year succeeded Sir Alexander Hood as director-general of Army Medical Services, becomes K.B.E., and there are three new knights bachelor—Mr. A. M. de Silva, surgeon to the General Hospital, Colombo; Dr. J. F. E. Prideaux, director-general of medical services at the Ministry of Pensions; and Mr. H. S. Souttar, consulting surgeon to the London Hospital and lately vice-president of the Royal College of Surgeons. This new honour to Mr. Souttar will give pleasure to a particularly wide circle of friends who have known him in such diverse rôles as mathematician, Army surgeon, director of a surgical unit, author, and chairman of the Central Medical War Committee, the council of the British Medical Association, the Medical Planning Commission, or the Medical Personnel (Army in India) Mission of 1942. Escaping mention in our impressive, but purely medical, list is the name of Miss Harriette Chick, D.SC., known as a nutritionist since her work in Vienna in 1919–22, and long a pillar of the Lister Institute. She is promoted D.B.E.

B.M.A. HARROGATE MEETING

THE 117th annual meeting of the association will be held this year at Harrogate, when Dr. C. W. Curtis Bain, the president-elect, will assume office. The annual representative meeting will open at 10 A.M. on Friday, June 24, continuing all day Saturday and Monday, and if necessary on Tuesday morning. The meetings of the eighteen scientific sections will begin on that day and will continue until July 1.

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Special Articles

FOOD IN HOSPITAL
BASIC AND SPECIAL DIETS

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IN some hospitals diet kitchens, with special staffs, have been installed; and the diets provided from these kitchens are usually more attractive than the food generally offered to other patients. But special diets would be required far less often if the main hospital diet was satisfactory. Experience shows that, when meals for all patients are well cooked and well served, only a few major variations are necessary in providing for special needs. The variants need less attention at present than the ordinary hospital diet, which is all too often deficient in quality and even in quantity.

The object of this article is to present a suitable basic diet and show the alterations necessary to provide special diets. All the latter, including those given to diabetic patients, can be constructed from the foods which hospitals can obtain.

EXAMPLES

The accompanying table begins by giving the estimated daily requirements of a moderately active man and a moderately active woman(I). (In some cases, of course, the requirements would be higher.) The basic diet (II) meets these requirements except as regards calories, and these can be provided by adding any other foods available.

Sometimes fish will have to be used instead of meat; but it can be cooked in various palatable ways to give variety. The objection of many patients to a fish diet can be well understood, since it is often served as a badly cooked unappetising watery mess. Fried fish, always a favourite dish, uses up more fat than can be afforded under present conditions; but grilled fish, for which much less fat is used, is just as palatable, and a good cook knows many other ways of presenting attractive fish meals.

Oatmeal need not always be served as porridge. It can be made into biscuits or included in soups, scones, or other recipes. Pulses can be made into soups or rissoles.

It is perhaps not generally known that an ounce of dried milk is allowed daily to every hospital patient and also to every member of the hospital staff. Since some patients are unable to take a full diet, this should provide a considerable store for emergency use. Dried fruit should not be used at times when there may be a glut of fruit, and at these times some of the points should be spent on more foods for storage and for use in emergencies. It is unjustifiable to withhold the spending of points, as sometimes happens in institutions, because some foods which have been ordered cannot be supplied. Something that will keep can always be put by for emergency or special use. It should also be remembered that some foods which are low in points may be of more nutritional value than those which are of high points value.

Gastric Diets.—The diet given before the war to patients with peptic ulcer was often deficient in most of the essential nutrients, including iron, B vitamins, and vitamin C, which was virtually absent. It was therefore not surprising that such patients improved when given Lenhartz and Sippy diets, containing large amounts of eggs and cream. During and since the war Lenhartz and Sippy diets have been replaced by frequent small feeds of fortified milk mixtures flavoured to give variety. The table gives examples (III and IV). Such mixtures can be supplemented with other foods as required, and the results are usually good.

An example of a full gastric diet (V) shows what can be done under present conditions. It is made up as follows:

BREAKFAST.—Milk, 3 oz.; weak tea. 1 egg (3 each week), or fish, or strained porridge. Bread, 2 oz. Butter, 1/4 oz.; marmalade, or jam, or honey.
MID MORNING.—Milk, 5 oz.; 'Ovaltine,' 1/2 oz.
MIDDAY.—Meat, 2 oz. (minced), or fish. Potato, 4 oz. Green vegetables (sieved), approx. 2 oz. Milk, 4 oz. (as chocolate mould). Bread, 1 oz.
2 P.M.—Milk, 4 oz.
TEA.—Milk, 3 oz.; weak tea. Bread, 2 oz. Butter, 1/4 oz. Cake, 1 oz.
SUPPER.—Fish, 2 oz. Potato, 4 oz. Carrots (sieved), 1 oz. Apple (sieved), 4 oz. Milk, 4 oz. Bread, 2 oz.
8 P.M.—Milk, 4 oz., as cocoa, ovaltine, &c.
10 P.M.—Milk, 4 oz. Cake or biscuits, 1 oz.
DURING NIGHT.—Milk, 4 oz.

In such a diet grated cheese is sometimes substituted for egg; for only 3 eggs are allowed weekly in gastric cases, though dried eggs when obtainable may be used. The eggs required for other patients should not be diverted to those with gastric disorders.

Low-salt Diets.—If a low-salt diet has to be continued for a long period it should be supplemented with calcium. Baker's bread contains much salt but can be specially baked without the addition of salt: on the average an ounce of baker's bread contains 102 mg. sodium and 159 mg. chloride, but an ounce of bread made without salt contains only 5 mg. sodium and 21 mg. chloride. The addition of small amounts of ordinary butter will reduce the insipidity of low-salt bread without seriously increasing its salt content. Here is the diet which is analysed in the table (VI):

BREAKFAST.—Tea, 20 oz. Milk, 3 oz. Bread, 2 oz. (made without salt). Butter, 1/4 oz. Marmalade, 1 oz., or jam, or honey. 1 egg.
MIDDAY.—Meat, 2 oz. Potato, 4 oz., and green vegetables, 2 oz. (both cooked without salt). Apple, 4 oz. Water, 6 oz. Orange juice, 4 oz.
TEA.—Tea, 20 oz. Milk, 2 oz. Bread, 1 oz. (made without salt). Butter, 1/4 oz. Jam, 1 oz.
SUPPER.—Fish, 4 oz. Potato, 4 oz. Root vegetables, 2 oz. (calculated as carrots). Tomato, 2 oz. Prunes, 3 oz. Water, 10 oz. Bread, 1 oz. (made without salt).
Allow 10 oz. water for the night.

Reducing Diets.—A diet of about 1200 calories (see table, VII) is commonly prescribed:

BREAKFAST.—Tea or coffee; milk, 5 oz. Bacon, 1 oz. (1 small rasher), or 1 egg, or fish. Bread, 1 oz. (1, 1/2-inch slice from a small loaf). Butter, 1/4 oz. (a piece size of half a walnut). 1 apple, or any other fresh fruit.
MIDDAY.—Meat, 2 oz., or fish, or cheese. 1 potato (average size), 4 oz. Green vegetables and root vegetables (a good helping of each). Fresh fruit, or stewed fruit without sugar; add saccharine if desired.
TEA.—Tea; milk, 5 oz. Bread, 1 oz. Butter, 1/4 oz. Tomatoes, 4 oz.
SUPPER.—Fish, 4 oz., or meat, or cheese. 1 potato (average size), 4 oz. Green vegetables or salad. Fresh fruit.

It is not usually necessary to reduce the salt or the fluid in these diets, for the reduction of bread and other starchy foods reduces the amount of salt, while they contain a considerable amount of fluid (90% in fruit and vegetables).

Low-fat Diet.—The following example of a low-fat diet (see table, VIII) more than covers the average nutritional requirements with the exception of vitamin D:

BREAKFAST.—Tea; Household skim-milk mixture, 8 oz. Bread, 3 oz. 1 egg. Marmalade, 1 oz., or jam, or honey. Cereal, 1 oz.
MIDDAY.—Lean meat, 3 oz., or fish. Potato, 6 oz. Green vegetables, 2 oz. Root vegetables, 2 oz. Pudding (skim-milk mixture, 8 oz.; cereal, 3/4 oz.). Plums, 4 oz., or any kind of fruit.
TEA.—Tea; skim-milk mixture, 4 oz. Bread, 3 oz. Butter, 1/8 oz. Jam, 1 oz. Cake, 1 oz.
SUPPER.—Fish, 4 oz., or meat sauce or flour and skim-milk mixture, 4 oz. Potatoes, 6 oz. Root vegetables, 2 oz. Tomatoes, 4 oz. Skim-milk mixture, 8 oz., flavoured as desired. Apple or other fruit, 6 oz. Bread, 3 oz.
10 P.M.—Skim-milk mixture, 8 oz., flavoured as desired.
Sugar for the day, 2 oz.
Milk Mixture.—Dried skim-milk, 6 oz.; water, 2 pints; flavoured with cocoa, coffee, &c.
Brewers' yeast, 1 oz. daily, mixed with some of the milk mixture; or it may be eaten with sweet biscuits.

With the addition of fat, this diet could be used for patients needing *high-protein diets*. Most high-protein diets are built up on one or more pints of one of the fortified milk mixtures (e.g., III or IV). These mixtures, which are suitable for tube feedings and for gastric and other cases requiring extra nutrients, can be made into beverages flavoured with ovaltine, Horlick's malted

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Food	No. of oz.	Carbohydrate (g.)	Protein (g.)	Fat (g.)	Calcium (mg.)	Iron (mg.)	Vitamin A (I.U.)	Aneurin (I.U.)	Riboflavin (mg.)	Niacin (mg.)	Vitamin C (mg.)	Vitamin D (I.U.)	Sodium (mg.)	Chloride (mg.)	Water (ml.)
I. ESTIMATED DAILY REQUIREMENTS (calories: moderately active man, 3000; moderately active woman, 2500)															
Moderately active man	..	..	70	..	800	12	5000	500	2·20	15	75	?	..	..	..
Moderately active woman	..	..	60	..	800	12	5000	400	1·80	12	70	?	..	..	..
II. BASIC DIET (to which any other food may be added) (1639 calories)															
Milk	10	15	10	10	345	0·20	400	39·96	0·40	1·00	..	9	..	..	..
Meat (or fish)	2	..	14	7	2	2·00	28	13·32	0·10	2·40	..	..	..	..	..
Fish (cod)	4	..	32	6	36	0·32	..	26·64	0·36	2·40	..	..	..	..	..
Bread	8	128	20	..	50	5·28	..	166·50	0·24	3·20	..	..	..	..	..
Butter (or margarine)	¾	..	..	18	3	0·03	855	..	..	..	..	9	..	..	..
Oatmeal	1	21	4	2	16	1·17	..	46·29	0·04	0·30	..	..	..	..	..
Potato (1 average size)	8	44	4	..	10	1·12	..	29·97	0·16	2·40	16	..	..	..	..
Green vegetables (calc. as cabbage)	4	2	..	..	66	0·52	340	19·98	0·08	0·32	28	..	..	..	..
Root vegetables (calc. as carrots)	3	5	..	..	42	0·40	5670	16·65	0·06	0·42	3	..	..	..	..
Haricot beans (or other pulses)	2	8	2	..	36	1·80	42	66·60	0·06	1·20	..	..	..	..	..
Dried Milk	1	14	10	..	348	0·30	8	33·30	0·45	0·80	..	..	..	..	..
Sugar (daily ration)	1	30	..	..	..	..	..	..	..	..	..	..	..	..	..
		267	96	43	954	13·34	7343	456·22	1·95	14·44	47	18	..	..	..
III. FORTIFIED MILK MIXTURE A (883 calories)															
Liquid milk (1 pint)	20	30	20	20	690	0·40	800	80	0·80	2·00	..	9	..	..	..
Full cream dried milk	2	22	15	16	544	0·16	600	56	0·68	1·40	..	12	..	..	..
Sugar, 1 oz., or lactose, or glucose	1	30	..	..	..	..	..	..	..	..	..	..	..	..	..
1 egg or a dried egg	..	..	7	7	3	1·44	320	28	0·18	1·60	..	36	..	..	..
		82	42	43	1237	2·00	1720	164	1·66	5·00	..	57	..	..	..
IV. FORTIFIED MILK MIXTURE B (312 calories)															
Dried skim-milk	2	28	20	..	696	0·60	16	70	0·90	1·60	..	..	..	..	..
Sugar, or lactose, or glucose	1	30	..	..	..	..	..	..	..	..	..	..	..	..	..
Water	20	..	..	..	..	..	..	..	..	..	..	..	..	..	..
		58	20	..	696	0·60	16	70	0·90	1·60	..	..	..	..	..
V. FULL GASTRIC DIET (2440 calories)															
Milk (allowance for gastrics)	35	52	35	35	1207	0·70	1400	140	1·40	3·50	..	16	..	..	..
Meat	2	..	14	7	2	2·00	28	13	0·10	2·40	..	..	..	..	..
Fish	2	..	16	3	18	0·16	..	13	0·18	1·20	..	..	..	..	..
1 egg	2	..	7	7	3	1·44	320	28	0·18	1·60	..	36	..	..	..
Bread	7	112	17	..	43	4·62	..	147	0·21	2·80	..	..	..	..	..
Butter (daily ration)	¾	..	..	18	3	0·03	855	..	..	..	..	9	..	..	..
Preserves	1	20	..	..	10	0·16	..	..	..	..	1	..	..	..	..
Cake (plain)	2	30	6	12	20	0·60	..	..	0·02	0·20	..	..	..	..	..
Potato	8	44	4	..	10	1·12	..	30	0·16	2·40	16	..	..	..	..
Green vegetables	4	2	..	..	66	0·52	340	20	0·08	0·32	28	..	..	..	..
Carrots	1	1	..	..	14	0·20	1890	6	0·02	0·14	1	..	..	..	..
Apple	4	9	..	..	4	0·04	12	16	..	..	4	..	..	..	..
Ovaltine	½	9	2	1	48	0·49	57	2	..	..	..	..	..	..	..
Cocoa	½	5	3	3	7	2·03	..	..	..	..	..	..	..	..	..
Sugar	1	30	..	..	..	..	..	..	..	..	..	..	..	..	..
		314	104	86	1455	14·11	4902	415	2·35	14·56	50	61	..	..	..
VI. LOW-SALT DIET (1611 calories)															
Tea, water	70	..	..	..	..	..	..	..	..	..	..	..	..	..	2100
Orange juice	4	6	..	..	36	0·40	84	16	..	0·40	48	..	47	4	120
Milk	5	7	5	5	172	0·10	150	20	0·20	0·50	..	..	71	130	130
Bread	4	64	10	..	24	2·64	..	84	0·12	1·60	..	..	108	84	44
Butter	¾	..	..	18	3	0·03	855	..	..	..	..	9	45	69	2
Preserves	2	40	..	..	20	0·32	..	..	..	..	2	..	10	4	8
Sugar	1	30	..	..	..	..	..	..	..	..	..	..	..	..	..
Meat	2	..	14	7	2	2·44	28	140	0·10	2·40	..	..	40	35	30
Fish	4	..	32	0	36	0·32	..	27	0·36	2·40	..	..	124	148	100
Potato	8	44	4	..	10	1·12	..	30	0·16	2·40	16	..	8	93	176
Cabbage (or other greens)	2	1	..	..	33	0·26	170	10	0·04	0·16	14	..	8	8	56
Carrots (or other roots)	2	2	..	..	28	0·40	3780	12	0·04	0·28	2	..	28	18	50
Tomato	2	2	..	..	8	0·20	568	93	0·02	0·20	8	..	2	29	56
Apple	4	9	..	..	4	0·04	12	16	..	..	4	..	2	2	100
Prunes (weighed dry with stones)	3	28	1	..	27	2·04	330	51	0·06	..	..	..	9	2	21
1 egg	(2)	..	7	7	3	1·44	320	28	0·18	1·60	..	36	77	90	44
		233	73	43	406	11·75	6297	527	1·28	11·94	94	47	579	716	3037
VII. REDUCING DIET (1274 calories)															
Milk	10	15	10	10	344	0·20	300	40	0·40	1·00	..	4	..	..	..
1 egg	(2)	..	7	7	3	1·44	320	28	0·18	1·60	..	36	..	..	..
Meat or fish	2	..	14	7	2	2·44	28	140	0·10	2·40	..	..	..	..	..
Fish	4	..	32	6	36	0·32	..	27	0·36	2·40	..	..	..	..	..
Butter	1	..	..	24	4	0·15	1140	..	..	..	..	13	..	..	..
Bread	2	32	5	..	12	1·32	..	42	0·06	0·80	..	..	..	..	..
Potato	8	44	4	..	10	1·12	..	30	0·16	2·40	16	..	..	..	..
Fruit (calc. as apple)	12	27	..	..	12	0·12	26	48	..	..	12	..	..	..	..
Green vegetables (calc. as cabbage)	4	2	..	..	66	0·52	340	20	0·08	0·32	28	..	..	..	..
Root vegetables (calc. as carrots)	4	5	..	..	56	0·80	7560	23	0·08	0·56	4	..	..	..	..
		125	72	54	545	8·33	8724	398	1·42	11·48	60	53	..	..	..
VIII. LOW-FAT DIET (2772 calories)															
Skim-milk powder	6	84	60	..	2288	1·80	48	210	2·70	4·80	..	..	..	..	..
Meat	3	..	21	10	3	3·66	42	210	0·15	3·60	..	..	..	..	..
Fish	4	..	32	6	36	0·32	..	27	0·36	2·40	..	..	..	..	..
Yeast	1	..	12	..	36	5·70	..	900	2·00	10·00	..	..	..	..	..
Butter	½	..	..	3	..	..	142	..	..	..	..	1	..	..	..
1 egg	(2)	..	7	7	3	1·44	320	28	0·18	1·60	..	36	..	..	..
Bread	9	144	21	..	57	5·94	..	189	0·27	3·60	..	..	..	..	..
Potato	12	66	6	..	12	1·68	..	42	0·24	3·60	24	..	..	..	..
Green vegetables (cabbage)	2	1	..	..	33	0·26	170	10	0·04	0·16	14	..	..	..	..
Root vegetables (carrots)	2	2	..	..	28	0·40	3780	12	0·04	0·28	2	..	..	..	..
Tomato	4	4	..	..	16	0·40	1136	186	0·04	0·40	16	..	..	..	..
Preserves	2	40	..	..	20	0·32	..	..	..	..	2	..	..	..	..
Cake	1	15	3	6	10	0·30	..	..	0·01	0·10	..	..	..	..	..
Cereal (including flour for sauce)	1	26	..	..	4	0·41	..	..	0·02	0·30	..	..	..	..	..
Apple	6	13	..	..	6	0·06	18	24	..	..	6	..	..	..	..
Plums	4	4	..	..	8	..	80	8	..	0·40	..	..	..	..	..
Sugar	2	60	..	..	..	..	..	..	..	..	..	..	..	..	..
		459	162	32	2560	22·69	5736	1846	6·15	31·24	64	37	..	..	..

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milk, 'Marmite,' cocoa, coffee essence, &c., or they can be made into soups, puddings, or ice-cream.

Any of these diets can be included in a good average hospital menu and most good cookery-books contain suitable recipes.

Diabetic Diets.—Diabetics who do not need insulin, or who are overweight, do not necessarily require the full allocation of the extra foods allowed them. (This of course must rest with the doctor in charge of the case.) Nor should it be necessary for them to have special diabetic foods; they can usually, with advantage, partake of the ordinary family diet controlled or adjusted to their special requirements. Some diabetics are still living at the expense of other members of their households because they have kept to pre-war diets requiring two rashers of bacon every morning for breakfast, and so on throughout the day.

KITCHEN AND WARD

The hospital kitchen under a good catering officer and qualified cooks, advised by a competent dietitian, could provide various special diets just as the hotel kitchen provides a variety of dishes to suit the palates of different customers.

Good ward service could be given by means of silent trolleys designed to hold several kinds of hot and cold dishes. Such trolleys could be conveyed from bed to bed by two persons—one a sister or staff nurse to place the food on the plates, and the other a nurse or orderly to hand it to the patients. By such means a good deal of "plate waste" (food uneaten) could be avoided, while patients would be interested in being able to choose, even if only a choice of pudding could be provided. An additional advantage of such a service would be to eliminate the time-consuming method of carrying each plate separately to patients up and down the hospital wards.

It has been suggested that it is a waste of time for nurses to serve food to patients; but feeding the patient is treatment, and often one of the best ways in which desirable contacts and observations can be made. Nurses should not, however, be required to undertake the cooking or the preparation of food; with a good catering service it should be possible for them to get additional foods whenever needed.

The standard of efficiency that prevails in the best hotels could also be achieved by the modern hospital. It would necessarily cost money, especially at first, but it would result in great savings particularly in drugs and medical treatment; and if it were extended to include the staffs of the hospitals, it would do much to maintain their health and morale.

INTERNATIONAL HOSPITAL FEDERATION

CONFERENCE IN HOLLAND

A HOSPITAL is a society in itself; but it is a constantly evolving society, owing partly to the changing practice within its walls, and partly to the varying needs and fortunes of the larger society that lies beyond. At the first post-war conference of the International Hospital Federation, held in Holland from May 30 to June 3 with Prof. RENÉ SAND (Belgium) as president, Dr. D. G. MORGAN (Cardiff) suggested that five circumstances had lately had an important impact on hospital life. These were: (1) increased knowledge; (2) the rising standard of living, which led patients to expect more of the hospital and to be better aware of their rights, and which also meant that hospitals less often encountered malnutrition and neglect; (3) two world wars, with the consequent shortage of houses and hospitals; (4) the fall in the birth-rate, which had resulted in a shortage of nurses and commonly the lack of anyone in the home to look after the patient after discharge; and (5) the shift of populations to the towns, which had caused an increased incidence of peptic ulcer and of high blood-pressure. The total effect was shortage of hospital beds.

HOSPITAL COSTS

Dr. C. T. MAITLAND observed that so long as people paid for their medical care, economic forces exerted a natural restraint. In Britain medicine was now a commodity, which like other commodities had to be rationed. There were, he suggested, four ways in which this situation might be met: (1) through preventive medicine, with the questions "Why is this patient in hospital?" and "Need he be here?"; (2) through clinical practice, abjuring the abuse of routine techniques; (3) through the legal field (X-ray examination was often undertaken simply because of its importance in any subsequent proceedings); and (4) through economy in the use of hospital beds. Allowing for the changed values of money, costs had not risen greatly; what was needed was a unit of cost-of-living to show how much of the increase was due to the impaired value of currencies and how much to the increased cost of maintenance and treatment.

Approaching the matter of cost from a rather different aspect, Dr. Y. VAN DER LEEN (Holland) urged that, as in business, so in the hospital, budgetary control should be exerted. Later speakers did not take too kindly to the idea. Was the budget, they asked, to be used simply to detect extravagance, or as a firm check on expenditure? If the budget was to be merely a check, then a percentage system, by which each department was expected to take up only a certain proportion of the total expenditure, was likely to prove as effective. If, on the other hand, the purpose was to control expenditure, then what happened when the hospital reached the limit imposed by the budget? Unlike businesses, which dealt in commodities whose cost was fairly easily reckoned, hospitals catered for an unpredictable number of patients in respect of whom the average cost might rapidly change through scientific innovations and other unforeseen circumstances.

HOSPITAL DESIGN

Though a specialty in its own right, hospital architecture is now learned usually only by trial and error; and this led more than one speaker on the designing of hospitals to suggest special provision for the architect's training. A demand was expressed, too, for closer integration, through lecture courses and meetings, between the people who work in hospitals and the architect, who might thus gain insight into the running of the hospital. Too often he was guided by other people, "like a blind man on a stony road." As to the cost of construction, more than one speaker pointed out that in 3–4 years this might be equalled by the cost of maintenance. About the principles of design there was less complacency. Mr. HJALMAR CEDERSTRÖM (Sweden) pressed for international coördination of research. Hospitals, he held, should be classified and standardised; and since no one country could hope to undertake all the necessary research, different countries should investigate various types of hospital. Mr. HUGO VAN KUYCK (Belgium) advocated the modular system, in which each component is of dimensions corresponding to a certain point on a fixed scale. The virtue of this arrangement is that the size of fittings, such as windows, can be standardised; not all were agreed, however, on the benefit of this system, and American opinion, fearing that it may freeze initiative in design, is for the most part opposed to it.

A Scandinavian representative, who was not denied, set the life of a hospital at 20–30 years, and argued that the development of new plans could not wait upon the results of fresh research. Dr. R. F. BRIDGMAN (France)

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maintained that the three present needs were: (1) flexibility, to meet changing needs; (2) economy in the size of the building; and (3) recognition of the changing form of the maternity and infectious-disease departments, and of the operating-theatre.

THE FORM OF HOSPITALS

The conference did not discuss in any detail the desirable size and form of hospitals; Sir ERNEST ROCK CARLING postulated, however, that a general hospital should serve some 250,000 inhabitants, while in conversation representatives from more than one country argued against the total number of beds exceeding 700–800.

Members were able to see for themselves some examples of recent construction in Holland. At the Wilhelmina Hospital, Amsterdam, and at the University Hospital, Groningen, new clinical departments, built during the '30s, take the form of separate buildings. Sometimes, of course, if the main block can take no extension this arrangement is unavoidable. Where the site is large enough, it has the virtue of giving free rein to the architect; and the effect can be pleasing, as is shown by the accompanying picture of a block at the Wilhelmina Hospital. On the other hand, if food is to be cooked in a central kitchen without special provision for heating in transit to the wards, it may need re-heating before it is served, and the divorcement of the separate blocks complicates the transport of patients to the ancillary departments, particularly in bad weather, while representation of these departments in each block is costly in personnel and money.

NURSING UNITS

Discussing the size of nursing units, most members seemed to agree that the optimum was ordinarily in the neighbourhood of 25 patients, and in pædiatric departments 17. About the number of beds in each room there was less agreement: 6, 4, and 2 all had their advocates; 3, it seems, is a fatal number ("Two's company, three's none"); besides, it was suggested, "each patient should be able to turn his face from his fellows and be alone." An attractive arrangement of a larger room has been contrived in the new surgical department at the Wilhelmina Hospital, where 12-bedded rooms have the beds grouped in threes, with the two central sets back-to-back and divided by a head-high partition, of which the upper part is glass.

In an able statement on nurse training and practice, Mrs. B. A. BENNETT commented that central supply services and case assignment represented opposing trends; and possibly the student nurse would in future have to be trained in both methods. Sharply criticising training arrangements, Mrs. Bennett said:

> "In most countries a national plan has been absent. Nursing administrators and teachers, finding the pattern of medical care changing, have added more and more to the curriculum, rarely eliminating any portion no longer necessary. In order to assure themselves that student nurses could understand the scientific implications of their tasks, they have undertaken instruction in the basic sciences to make up for the lack in the students' previous education. Too few girls with a sound liberal education have been available for training, and those with minimum high-school graduation or an elementary education have been admitted to the schools for training. The so-called students have found that too much routine work and domestic work, coupled with a heavy curriculum, left them overwrought and overtaught."

As to the shortage of nurses:

> "It is a pathetic position that where there are facilities for training nurses, there are too few to meet the demand and where there are numbers of women who would nurse there are few or no facilities for training them."

Private discussion revealed that even some European countries fall into the second group; and this provoked the question whether Britain, which with 38,000 more nurses than in 1938, still has fewer nurses than it needs, could not accept for training more foreign nurses in return for their services to the hospitals. They might indeed go also to Holland where the shortage appears to be equally acute. The Wilhelmina Hospital, with 1600 beds, has 400 closed, while the remaining 1200 are operated by 900 nurses; at Groningen 800 beds are operated by 500 nurses.

REGIONAL PLANNING

An account, by Dr. MAITLAND, of the regional planning of the British health services was followed by a discussion which showed that, at least as far as hospitals are concerned, nearly every country recognises the need for regional grouping, though some are still impeded by legislative limitations.

Sir ERNEST ROCK CARLING suggested that among the questions to be answered were: What is the optimum size of the region? To what extent should it be divided? How much decentralisation is desirable, and how much power should be delegated? Clinically the size of the regions in the United Kingdom was satisfactory; and he himself maintained that there should be a regional nursing service. He argued that power, including financial control within a budgetary limit, should be delegated to local management committees; for these needed competent members, who would not serve unless they were free to implement their decisions.

The position in the U.S.A. was described by Dr. VANE HOGE. The duty of the central government, he said, was confined to aiding and coördinating the efforts of the 48 States; and the functions of the federal Public Health Service, which collaborated with the American Hospital Association and other groups, were to lead and advise.

The basic problem was the same as in Europe. Hospitals were of three types: (1) government, (2) non-profit, and (3) private. From the beginning of the present century construction proceeded apace, and with particular speed in the ten years that followed the end of the

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1914–18 war. In 1928 nearly 7000 hospitals were in operation, but in the ensuing ten years over 600 closed their doors; the reason was that these were not well planned or spaced, and thus could not survive the depression.

Just before the second war factories were dispersed; and this revealed that hospitals were not properly distributed and that the hospital services were not suitably coördinated. Thus in 1943 the American Hospital Association decided to seek the federal government's help in building and siting hospitals; and the government set up a commission on hospital care, which reported in 1946. The association then decided to ask Congress for help, and the federal Public Health Service, working with hospitals and doctors, formulated a national programme, which was incorporated in the Hospital Construction Act, passed in the same year.

During the next twelve months each State surveyed its needs and proposed plans for approval by the federal government; and in the subsequent year the government grant under the Act—$75 million per annum—was distributed for the first time. This sum was insufficient, so a priority list was formed on the basis of the population and wealth of each State. Already 400 hospitals were under construction, while a further 400 were planned. The programme was to continue for five years, but even then only 15% of the needs exposed by the reports from the States would have been covered.

The State plans called for a regional arrangement with a so-called "base area" (consisting of a teaching hospital) at the centre, and with intermediate and rural areas towards the periphery. It was hoped that in a few years these three areas would be administratively linked, though this would depend on voluntary agreement; the States and the universities recognised that only thus could good hospital services be afforded to each rural area.

In France, Dr. BRIDGMAN explained, hospitals are being surveyed and classified, with the purpose of establishing a regional scheme; at the centre of each region will be a teaching hospital (which will also deal with the rare specialties), and towards the periphery the general hospitals and the local hospitals, which will have to be modernised and will serve as a link with the preventive services.

A representative from Switzerland declared that his country had been divided into health districts since 1292; for hospitals were the concern of the individual cantons. The trouble was that some cantons (mostly the large ones) were rich, while others were poor; and thus the service was not uniform. A non-governmental survey was now being made; and it was hoped that in 3–4 years there might be a nation-wide plan with which the cantons would be willing to comply.

Other contributors told how in the Republic of Ireland a regional scheme is being developed around the three universities; in Sweden there are 30 hospital districts; in Norway hospitals are to be organised in some 20 regions, while in Denmark they are already grouped in 18 regions; in Italy the new constitution lays down hospital regions; and Portugal has legislation for regional and local hospitals.

Finally, Dr. MAITLAND reminded the conference that while the regional planning of hospitals was easy, the synthesis of hospital and other medical services was not so easy.

OTHER MEETINGS

A discussion on the Vocation, Aim, and Task of Hospitals was opened by Dr. E. HOELEN (Holland). Papers were presented on the Influence of Economic and Social Changes on Hospital Administration by Prof. F. PULCHER (Italy), on the Training of Hospital Administrators by Mr. GEORGE BUGBEE (U.S.A.) (read in the author's absence by Captain J. E. STONE, the hon. secretary); and on Personnel Management in Relation to Hospital Service by Mr. J. N. APPELBE. The proceedings are to be published.

At the general assembly, on the last day of the conference, it was announced that the executive committee proposes to establish in London an international bureau of hospital information. Three study committees are to be set up—on hospital design and construction, on administration, and on patient care. The federation is also to start its own bulletin as soon as funds suffice. The committee had accepted an invitation to hold the next conference, in 1951, in Atlantic City; but members pointed out that, while American hospitality would minimise the cost of stay in the U.S.A., the expense of crossing the ocean might prevent many Europeans from attending. The committee agreed to reconsider the position. The theme of the next congress is to be the regional organisation of medical care.

HEALTH SERVICE ESTIMATES

SELECT COMMITTEE'S REPORT

THE administration of the National Health Services has been reviewed by the Select Committee on Estimates, whose report was published last week as a blue-book.[1] The committee suggests that, while it is too early to judge whether the services as a whole are being managed economically, there is scope for review of their detailed working and of the remuneration and conditions of service of those engaged in providing them. There is also need for public recognition that abuse of the services may threaten their maintenance and further expansion.

The administrative costs and staff of executive councils appear to the committee to be reasonable; but the system of admitting doctors to a council's list should, it says, be examined with a view to making it simpler and more speedy.

The earnings of some dentists under the scheme are found to be excessive; and the Health Departments are advised to examine the schedule of cases which dentists have to submit for prior approval to the Dental Estimates Board, with a view to reducing their number.

Greater care, the committee claims, should have been taken in framing the original estimate for the supplementary ophthalmic services in 1948–49. To avoid abuse of the pharmaceutical services, the Health Departments should make regulations for the purpose of preventing excessive or wasteful prescriptions; and the schedules of medicines and appliances available under the health services should be reviewed from time to time.

As regards the hospital service, the system of administration should be examined as soon as enough working experience is accumulated; in England and Wales a uniform system of costing should be devised, and the question of setting up an internal efficiency audit, similar to that carried out by Scottish regional boards, should be examined.

The committee points out that the efficiency of the service cannot be gauged while it is still in its infancy; but "it was gratifying to find from the evidence that, on the whole, the scheme was settling down with surprisingly little friction."

THE COST

If the estimates prove correct, the cost to the taxpayer of the National Health Services in 1948–49 (including the cost of headquarter administration) will be about £261 million, after deduction of the £40,700,000 which is to come from National Insurance contributions. (The total expenditure in connexion with the services is estimated at over £352 million.) "There is a wide-

1. Seventh Report from the Select Committee on Estimates: Session 1948–49. The Administration of the National Health Services. H.M. Stationery Office. 4s.

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spread belief that the whole of the cost of the National Health Services is provided by means of the National Insurance contributions," whereas actually appropriations for this purpose amount to the equivalent of 1½*d.* a week from each employer, 10*d.* a week from each self-employed and non-employed person, 8½*d.* or 6½*d.* respectively from each male or female employee over 18 years of age, and 4½*d.* from each boy or girl employee under that age; and these contributions will cover only about one-ninth of the whole cost.

GENERAL MEDICAL SERVICES

The estimated expenditure by executive councils on administration is about 2% of their total expenditure (though in reckoning the complete cost of administration Departmental expenses must be added). As to the staffing of executive councils, "the danger, at present, seems to lie in shortage of suitable staff for the job rather than in overstaffing, and the establishments did not seem to be excessive for the volume of work."

Patients complain of delay in obtaining treatment and of queues in doctors' waiting-rooms, and this is due partly to the uneven distribution of practitioners; in Scotland the proportion of doctors to patients varies in different areas between 1 : 1018 and 1 : 2646. The system of filling vacancies on the lists of executive councils was described by a witness as cumbrous and likely to deter a doctor anxious to join the scheme; and an instance was quoted of a death vacancy being unfilled after four months.

GENERAL DENTAL SERVICES

The revised estimate for dental services in England in 1948–49 was 2½ times the original figure; "some of the assumptions made by the Departments in framing their Estimates were, to say the least, optimistic." The committee heard evidence of some of the difficulties caused by the system of contract between dentists and executive councils.

"Instances have been reported of dentists refusing to extract the teeth of patients suffering acute pain, unless the patient offered to pay; and as dentists are paid by piecework, with no limit to the number of hours that can be worked, exceptionally high earnings can be made. . . in Renfrewshire, for example, there was in November one dentist receiving between £1300 and £1400 gross a month, and at least two others, single dentists without assistants, receiving over £800 a month. . . . Your Committee appreciate that dentists incur higher expenses in the course of their practice; nevertheless, it may be noted that the General Dental Services, involving some 9000 dentists, are estimated to cost £30,904,000 in 1949–50, as compared with £45,800,000 for the General Medical Services involving over 19,000 doctors."

In support of the argument for reducing the number of cases where prior approval by the Dental Estimates Board is required, the report cites estimates for the extraction of a number of teeth for people who require dentures and who are not below a certain age, where approval is given without further inquiry.

SUPPLEMENTARY OPHTHALMIC SERVICES

In 1948–49 the revised estimate for the supplementary ophthalmic services was £14,970,000—more than six times the original estimate of £2,330,000. The difference, says the report, was due to failure to take full account of rate of demand and of the number of people to whom the service was to be available; moreover, the cost of providing spectacles was underestimated. Whereas the cost was originally assumed to be the same as under National Health Insurance—namely 40–45*s.*—it turned out to be 65*s.* 6*d.*, the fees for sight-testing having been doubled. The committee "have no conclusive evidence that the safeguards are adequate to prevent people obtaining more spectacles than they are entitled to under the scheme." Furthermore if unpleasant repercussions are to be avoided remuneration in the ophthalmic, as also in the dental, service should be settled as early as possible.

PHARMACEUTICAL SERVICES

That the number of prescriptions per head is higher under the National Health Services than under National Health Insurance, the committee attributes partly to the publicity which the new service received, and partly to patients taking the fullest advantage of the opportunity to obtain without charge such things as bandages and aspirin. Evidence suggested that the pricing bureaux have hitherto erred on the side of leniency.

With regard to the family-practitioner services in general, the committee "have found no obvious major defects in the administration."

HOSPITAL SERVICES

The committee speaks with approval of the practice in Scotland whereby the regional hospital boards employ an internal audit staff which not only examines expenditure to see that it has been legally incurred but also deals with questions of administration and assists boards of management in compiling statistics of costing; these are prepared in a form which gives the average cost per bed for different types of hospital. In England and Wales some regional boards and at least one teaching hospital are keeping statistics of cost on their own initiative, but so far no uniform system has been evolved.

The original hospital estimates for 1948–49 fell short of the eventual need by some 10–15%, for a number of reasons, among which were the increased wages for staffs, and expenditure on maintenance of buildings and plant which it had not been possible to undertake during the war.

"It was also suggested that local authorities, on discovering that they were not going to be responsible for running the hospitals under the National Health Services, had cut down expenditure on items of major importance in 1946 and that, because of this, expenditure in 1946 had proved to be a false guide in framing the original Estimate for 1948–49."

The cuts imposed this year, with a view to bringing down the expenditure by boards to the same level as in the year ended March 31, amount on average to 8% of the estimates submitted in the case of teaching hospitals in England and Wales and 5% in the case of non-teaching hospitals.

"Where a comprehensive cut of this kind has to be made," the committee concludes, "the burden inevitably falls with uneven degrees of hardship. So far as capital expenditure is concerned, it was generally agreed by the witnesses examined that the reduced expenditure would probably be enough for the most urgent work to be carried out, but varying accounts were given of how the other reductions in expenditure would affect hospitals. One witness from a Scottish Regional Board stated that he did not think the cuts would embarrass the Board seriously in carrying on existing services. Another witness, however, claimed that the expenditure allowed in his district had been reduced so drastically that it would not now be possible to use wards for which staff were available. It seems clear that the Ministry of Health will be approached by some of the Boards with a statement that the cuts in expenditure cannot be made without seriously endangering the standards of service provided. For, apart from expenditure which has been reduced as a matter of policy, the original estimates submitted by the hospitals for 1949–50 did not allow any money to cover unforseen expenditure; this was in accordance with the express instructions of the Departments. Moreover, it must be remembered that there are fairly narrow limits to the expenditure which can be reduced by the actions of Hospital Boards. Salaries and wages form over 50 per cent. of the total cost of running a hospital and are settled according to scales agreed centrally. The expenditure which least directly affects the welfare of patients and in which a cut would most naturally be sought, namely administration, forms only 2 per cent. of the total cost."

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AERIUM, PREVENTORIUM, AND SANATORIUM

DERMOD MACCARTHY
M.D. Lond., M.R.C.P., D.C.H.

THOMAS STAPLETON
M.A., B.M. Oxfd, M.R.C.P., D.C.H.

VILLARD-DE-LANS, where the first international congress of *Climatisme Social* was held in March, is a remarkable place and fully justifies its postmark of *Le Paradis des Enfants*. Near Grenoble, it stands on a plateau 1000 metres high, surrounded by snow-clad mountains and sheltered from strong winds. It has places for about 1500 children, mostly in small homes run simply but sensibly, some of them admitting children under five. There are two boarding-schools, one for boys and one for girls; the former has four houses, each for 60 boys aged fourteen to eighteen years. In the boys' school which we visited the system of houses and private studies and the standard of work of the scholars compared well with those of the best English public schools; and an English public school is arranging to exchange one boy each term with Les Sapins. The only other large establishment is the aerium, a big hotel converted to hold 250 children. It has a resident doctor and nursing staff. Twelve miles away, on another mountain plateau, at Autrans, is a newly built preventorium taking about 200 children, also with medical and nursing staff.

Much of the time of the conference was spent in discussing and redefining the functions of the three types of establishment—aerium, preventorium, and sanatorium. Their definition is important if the present attack on tuberculosis in France is to be properly applied. The main features of this attack are (1) routine tuberculin-testing of school-children and as far as possible of younger children; (2) close supervision of the child with a recent positive reaction; (3) removal of the susceptible tuberculin-negative child or baby from contact with a tuberculous adult in the home; and (4) inoculation with B.C.G.

The aerium is a convalescent home to which tuberculin-negative children who are in contact with a tuberculous adult may be sent till the adult has been found other accommodation. Inoculation of these children with B.C.G. in the aerium is advocated. Tuberculin-positive children should not be sent there unless it can be shown that their allergy is due to inactive lesions or to B.C.G. inoculation. The main purpose of the aerium, however, is to take children suffering from various forms of chronic ill health other than tuberculosis and give them special care and medical supervision for at least six months. Some education is provided.

The preventorium is for children who have lately been infected with the tubercle bacillus, as shown by a Mantoux conversion. Its purpose is to prevent systemic dissemination of the disease by keeping the child under conditions of limited activity with extra rest, good food, and fresh air, in a healthy climate. The preventoria are equipped with X rays, and cases of pulmonary tuberculosis of doubtful activity or reaching the quiescent stage may also be observed there; but those developing active lesions at the preventorium must be segregated.

The preventorium is a good answer to the problem of the recently infected child. The child dying of tuberculous meningitis, with a radiographically normal chest and a minimal primary complex revealed post mortem, is a familiar example of the dangers of this stage.

Both establishments we visited were well designed and equipped, pleasant, and spacious, even palatial. But the management of 200 or more children of all ages under one roof presents many difficulties. The creation of a separate quarantine station has solved some of these, but there are others. The small child is apt to feel lost in a big boarding-school atmosphere. To overcome this, the little ones are divided into small groups in charge of a monitor, and each group leads a family life of its own.

Villard-de-Lans has taken the important step of protecting its children from tuberculosis by a law prohibiting all tuberculous persons, adult or child, from staying there.

Where, it may be asked, does *climatisme* come in? France has a greater variety of climates than England, and the French have exploited the special advantages of their country; but the effects of atmospheric conditions on health are often too subtle to be distinguished from those of feeding, environment, and general care. None of the papers read to the congress penetrated at all deeply into this difficult problem; but it was agreed that on the next occasion the physiological and clinical bases for placing certain children under certain conditions should be thoroughly examined. We must admit that our own scepticism weakened considerably under the influence of the sparkling air of Villard-de-Lans. One of the benefits of this conference was to make us realise, as pædiatricians, how much is involved when a child is removed from its own home for reasons of health. We should do well to study the clinical side of convalescence more closely, as the French have done, and consider whether our present use of health resorts, convalescent homes, open-air schools, and sanatoria is sound, or haphazard and wasteful.

The conference included delegates from Austria, Belgium, China, England, Greece, Holland, Italy, Luxembourg, and Switzerland. All were moved by the warmth of their greeting from Prof. Robert Debré, its president and initiator, and all were glad to enjoy again the hospitality, originality, and intellectual brilliance of France.

BIRTHDAY HONOURS

IN the Birthday Honours, announced last week, the Royal Victorian Chain was conferred on Sir John Weir, G.C.V.O., in recognition of his long and distinguished services as physician to the King. The list of honours also contains the names of the following members of the medical profession:

K.B.E. (Military)

Lieut.-General NEIL CANTLIE, C.B., M.C., M.B. Aberd., F.R.C.S., K.H.P.
Director-general, Army Medical Services.

Knights Bachelor

ARTHUR MARCELLUS DE SILVA, C.B.E., F.R.C.S.
Member of the public service commission, Ceylon.

JOSEPH FRANCIS ENGLEDUE PRIDEAUX, C.B.E., M.R.C.S.
Director-general of medical services, Ministry of Pensions.

HENRY SESSIONS SOUTTAR, C.B.E., D.M., M.CH. Oxfd, F.R.C.S.
Consulting surgeon, London Hospital.

C.B. (Military)

Air Vice-Marshal FREDERICK JOHN MURPHY, C.B.E., M.B. Dubl., K.H.S., R.A.F.

Major-General KENNETH ALEXANDER MACDONALD TOMORY, O.B.E., M.B. Edin., K.H.P., late R.A.M.C.

C.M.G.

CHARLES NORMAN ATKINS, M.B. Melb.
City health officer for Hobart, Tasmania.

CHARLES HERBERT HAMPSHIRE, M.B. Lond., F.R.I.C.
Secretary, British Pharmacopœia Commission.

JAMES GRANT SMITH TURNER, M.B. Glasg.
Director of medical services, Gold Coast.

C.B.E. (Military)

Brigadier DAVID FETTES, O.B.E., M.B. Aberd., F.R.C.S.E., K.H.S., late R.A.M.C.

Surgeon Captain JAMES HAMILTON, M.B. Glasg., R.N.

C.B.E. (Civil)

CHARLES WORTHAM BROOK, M.A. Camb., M.R.C.S.
For political and public services.

FRANCIS HENRY KNETHELL GREEN, M.D. Lond., F.R.C.P.
Assistant secretary, Medical Research Council.

THOMAS KEITH LYLE, M.D., M.CHIR. Camb., M.R.C.P., F.R.C.S.
Civil consultant in ophthalmology, Royal Air Force.

ALEXANDER FLEMING WILKIE MILLAR, M.D. Edin.
Chairman, Scottish Medical Practices Committee.

RALPH MONTGOMERY FULLARTON PICKEN, M.B. Glasg.
Provost and Mansel Talbot professor of preventive medicine, Welsh National School of Medicine.

THOMAS EDMUND ALEXANDER STOWELL, M.D. Durh., F.R.C.S.
For services to industrial medicine.

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O.B.E. (Military)

Surgeon Commander WILLIAM VINCENT BEACH, F.R.C.S.E., R.N.

Wing-Commander EDWARD ALEXANDER RICE, M.B. Belf., R.A.F.

O.B.E. (Civil)

ALBERT WILLIAM JOHN CRAFT, M.R.C.S.
Principal medical officer, Ministry of Pensions.

KIRIKANKANANGE JUSTIN DE SILVA, L.M.S., J.P.
For public services in Moratuwa, Colombo.

JOSEPH ELLUL, M.D. Malta, F.R.C.O.G.
Professor of midwifery and gynæcology, Malta.

JOSEPH HUBERT FERNANDO JAYASURIYA, F.R.C.S.
Senior surgeon, General Hospital, Ceylon.

Mrs. ALEXANDRA MARGARET ANNE JOY, M.B.
For services in isolated areas of Lake Grace, Western Australia.

THOMAS PERCY REES, M.D. Wales, M.R.C.P.
Medical superintendent, Warlingham Park Mental Hospital.

HO KO TSUN (Honorary)
Medical Officer in Charge, Eastern Chinese Public Dispensary, Hong-Kong.

ARUMUGAM VISWALINGAM, L.M.S. Singapore.
Lately ophthalmic specialist, Malayan Medical Service.

NOEL EVERARD WATERFIELD, M.B. Lond., F.R.C.S.
County director, Surrey branch, British Red Cross Society.

EDWARD MILNS BAINBRIDGE WEST, B.M. Oxfd.
Chief officer, African affairs department, Southern Rhodesia.

GERALD RICHARD COURTENAY WILSON, M.R.C.S.
Acting senior medical officer, Tanganyika.

WALTER GERALD WICKREMASINGHE, M.R.C.S.
Acting director, medical and sanitary services, Ceylon.

M.B.E. (Military)

Major ROBINA MARY DUNCAN MORRELL, M.B. Lond., R.A.M.C.

M.B.E. (Civil)

MAURICE PENNEFATHER BROWNE, M.R.C.S.
Medical officer, Gold Coast.

JOHN MINTO FITTON, M.B. Leeds, F.R.C.S.
Orthopædic surgeon, Mauritius.

Captain ARTHUR GEORGE TEASDALE MATTHEWS,
Medical Officer at H.M. agency and consulate, Muscat.

WILLIAM GEORGE ROSE, L.R.C.P.E.
Medical officer for eastern districts, Southern Rhodesia.

REGRADING ON APPEAL

THE Ministry of Health announces changes in the procedure previously laid down for considering cases in which practitioners disagree with their grading on review. After discussion with the Joint Committee of Consultants and Specialists it has been agreed that, for the purpose of reconsidering such cases, the review committees advising regional boards should be enlarged by two members: (*a*) one nominated by the appropriate Royal College (physician, surgeon, or obstetrician and gynæcologist), and (*b*) one drawn from the reviewing committee of an adjoining hospital region. Similarly, boards of governors of teaching hospitals are asked to arrange that reviewing committees shall be enlarged by the addition of two members drawn from the medical staff committee of another teaching hospital, one of whom should be of the specialty of the practitioner whose grading is under review.

Further consideration has been given to the restriction stated in a previous memorandum as follows:

"It is appreciated that in some cases it may not be possible for reconsideration and any consequent regrading to be completed in time to take effect from July 5 next. It has therefore been agreed that remuneration at a higher rate as a consequence of any regrading on appeal shall be applicable *from the date of regrading only*, and not retrospectively, where the regrading is completed after July 5 next."

This is to be replaced by the requirement that no appeal lodged with a regional hospital board or board of governors after July 4, 1949, or more than fourteen days after the notification of grading to the practitioner, whichever is the later, shall be considered. The paragraph quoted above is accordingly cancelled; but it should be appreciated that any practitioner whose appeal is out of time, and who subsequently obtains a consultant post on the recommendation of an advisory appointments committee constituted under the National Health Service (Appointment of Specialists) Regulations, 1948, will not be able to claim retrospective adjustment of salary at the higher rate from July 5, 1948.

Practitioners whose appeals were considered by a reviewing committee identical with the committee which first graded them will be given a further fortnight in which to lodge an appeal, so that it can be referred to the committee enlarged as now arranged.

Disabilities

32. ANKYLOSING SPONDYLITIS

IN my fourteenth year I began to drift from the turbulent torrent of health into the backwater of sickness, and my adolescence was moulded by a hospital ward. I am now twenty-nine. The year that I was to sit for my matriculation began with three attacks of influenza in series. A course of prophylactic injections against another attack was followed by twelve weeks in bed with a diagnosis of rheumatic fever. This was succeeded by four weeks in hospital, and when I was discharged I continued for some time as an outpatient, receiving diathermy and exercises. As the weeks went by I noticed that my back was getting bent forwards, that my hips were painful to lie on in bed, and that it was an effort to walk, though I could still cycle without undue fatigue. Finally my condition worsened to the point where I consulted an orthopædic surgeon and was placed on a plaster-bed for six months. From this I emerged with my back straight; but in spite of wearing a spinal jacket I soon became bent forward again, and my hips also began to stiffen. I could now only get about with two sticks, and in buses and trains I had to get up a few minutes before my destination in order to straighten up sufficiently to move before the time came to get off.

I was becoming so crippled that I sought further medical advice, as a result of which, in my sixteenth year, I entered hospital once again, where my complaint was for the first time correctly diagnosed; doubts and delusions were swept away, and from the deep sea of "rheumatism," "sciatica," "fibrositis," I had arrived at the harbour of spondylitis.

I spent the next four years on my back with skin traction on my legs, and during this time ankylosed completely except for one ankle, my arms, and my neck. These were not unhappy years, though one's values changed, and one adapted one's self accordingly. In my horizontal position a head-mirror became indispensable, the universal joint with which it was fitted helping to compensate for my rigid cervical spine. Eating by reflexion was a knack soon acquired, and half-filled cups solved the drinking problem. (No drink tastes the same out of a feeding cup.) Finally I was allowed to get up—for only a minute the first day. Later, trussed in a spinal jacket and callipers, I was able to make halting progress with my crutches. So it was that I returned home at the outbreak of war. During the war years I was unable to get any orthopædic supervision, and the disease made further advances; my right leg shortened, and the ankylosis spread to my neck, and affected my jaw. I went into hospital again just before Christmas, 1948, and recently returned home again.

I sleep on the ground floor, as I cannot manage stairs. Callipers are a thing of the past; I wear ordinary shoes, and the uppers don't wear out since I cannot bend my feet to crease them. Excursions from my home have increased in distance, and I manage to get down to the town and support the local football club. My right leg is half an inch shorter than my left, and my feet being fixed 14 in. apart I stand at a slight angle when both are on the ground. In consequence it is much easier to walk

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when the ground is sloping in the right direction to compensate for this, and I choose the path on the side of the road which cambers accordingly. I can also manage on the level, but I find a slope in the wrong direction most difficult to manage, as it tends to tip me over sideways. My method of locomotion is to swing along on crutches—with both feet at once because I am quite stiff and rigid. I manage to make about one knot this way. The five degrees of movement I have in my left ankle is a boon: it means that I am able to get a spring off as I swing along.

Fortunately my shoulders are sufficiently mobile to allow me to shave, but my hair is out of reach. In the same way I am dependent on someone to put on my shoes, socks, and trousers, and I can conceive of no method of remote control by which to tie my shoe laces, or cut my toenails. I can get up without assistance; but standing has brought its own problems, for my feet become quite black if I stand for an hour or more. The skin of my toes is dry and scaly, presumably because the blood stagnates there; and they are intolerably itchy at times. When this gets really bad I have to curtail my activities or the skin breaks down. As I can only stay on my feet for an hour or so, my excursions abroad are also limited to this time, for I cannot sit down and rest on the way. My inability to negotiate steps also limits my activity, and being unable to bend prevents me getting into a car; so for journeys further afield I have a spinal carriage. On my first outing in this I felt like a body in a coffin and saw only a few tree-tops en route. After that I had the head-end built up, so that my range of vision was increased to its maximum and I felt less like Edgar Allan Poe's victim of premature burial. Incidentally, at night I must have a firm mattress and fracture-boards to lie on. A soft spring mattress finds me suspended on my heels and the back of my head.

Apart from the irritation and swelling of my feet, I have encountered two other complications. One is a receding of my lower jaw, so that my front teeth no longer meet, and I have some pain and difficulty in eating at times. The other is that with a chest expansion of nil, any cold that I get is accompanied by a troublesome and persistent cough. In many ways, however, I am becoming more independent. In hospital there were so many worse cases that there was every incentive to do as much as I could for myself. I learned, for instance, to use the bedpan while standing in the lavatory, instead of using it in the bed as I had done for 12 years. Since my return home a fortnight ago I have made a further advance, and learned to use the lavatory by leaning backwards over it—not without a little trepidation at first, but with good results.

In spite of my disabilities my pastimes are many and varied. My piano is raised on 9-inch wooden blocks, and with the music on top I am able to stand and play. I manage a fair game of table-tennis (left-handed, because I have a fuller range of movement in that arm) but only on a small table or I am easily out-positioned. I play snooker (though hardly with the approved cueing stance), again on a small table. The various forms of occupational therapy are a pleasant diversion, and I do quite a bit of cane-work, leather-work, and rug-making.

* * *

Spondylitis is not a bad disease, as diseases go. It is clean, it is not deforming, and once the joints are ankylosed they are pain-free. But the disability is severe, and being unable to sit is a great inconvenience and frustration. No, spondylitis is not a disease that I would recommend, but it is bearable, provided one does not dwell on what one cannot do, provided one is well looked after, and, above all, provided one has a sense of humour, against which neither the slings nor arrows of outrageous fortune can prevail.

In England Now

A Running Commentary by Peripatetic Correspondents

As a graduate I have come to realise the benefits that accrue from there being *two* older universities. Such disloyalty to my alma mater would have seemed criminal in those distant days before I appended those magic initials to my name, when I became a Bachelor of Arts because I had taken an examination in science. Fate has ordained that it is to the sister university that I go more frequently now—and indeed my lines are set in pleasant places.

I saw Oxford first some months before I went up to Cambridge. It was on a frosty moonlit January night in 1917, when the High was devoid of cars and lighting restrictions were in full force. Few people, civilians or military, were about. The Cher flowed as sweetly as Thames; mystery enshrouded the Magdalen cloisters; the echo of distant footsteps sounded down Holy Well; and the beauty of the High was enriched by blended silver and shadow on stone and pavement. At such moments it is not to the famous sons of the university that one's thoughts turn but to the multitudes of the forgotten. Mere boys, like Sidney and Donne coming into residence at 14 or 15, coming up from country vicarages or lordly halls, from Paul's School or Westminster, to sit before Grocyn and Erasmus and later teachers, and taking away far more than formal learning.

No-one, so far as I know, has explained why residence at the older universities confers a quality on a young man, rich or poor, that five or six years at a London medical school does not bestow on his brother; yet my colleagues with their London M.D.s send their sons to Oxford or to Cambridge, silently confirming the difference. If there is an answer it is not material. It lies in poetry—Oxford sang for me on that first frosty night, as she sang last week, when after driving through a shimmering English countryside which would have defied any painter, save Sisley or Steer, I came past Bagley Wood and into the aura of Oxford's spires again. However much atomic knowledge emerges from Harwell or the Cavendish it is in poetry if anywhere that the explanation of our undergraduates' differences will be found. The bells of Tom Quad, the fluted vaultings of King's Chapel, the Tudor roseate hues of Queen's, the antiquity of Merton. And one cannot dine night after night in New College hall, or beneath the picture gallery of Cambridge's Trinity or Oxford's "House" without inheriting a pneuma that the Greeks could not explain and the modern makes little attempt to understand.

* * *

We had had a bad night in the men's ward the night before, with two patients moaning, raving, and trying to get out of their beds. One of them, usually addressed as Dad, was almost opposite me. His outbursts of shouting—"Oh dear, oh dear, Dorothy, Dorothy, where's mother? Come and loosen the bandage, it's stopping the blood. You're murdering me"—were varied by spasms of contrition for the trouble he was giving the nurses and acknowledgments that he was a "damned bad patient." Thoughtlessly I considered him a cowardly, selfish, old man, till my doctor spoke of my misfortune at sharing a ward with two such ill men. Belatedly my irritation turned to sympathy.

The second night and day Dad was fairly quiet, but his quiescence was not a sign of recovery. The screens were pulled closer round his bed, the lamp above was reduced to a glimmer by a black pall-like cloth, and the nurses went to him often. Two relations walking through the ward to his bed could hear the strains of "Hi Gang!" percolating through the headphones of the other patients. As "Much Binding" took the air, Dad's breathing became more laboured.

About three in the morning I woke to hear a restless final stirring from his bed—and then silence. The ward nurse went to fetch the night sister and whispered, "he's gone." They brought a relation who must have been waiting for this summons; she walked through the silent but not sleeping ward, waited a moment by the bedside, and returned down the full length of the ward. Then the nurses got down to their

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work. The scraping of a razor on a long growth followed the swish of the shaving brush. The smell of spirit came gently through the ward. My bed was jolted slightly by a porter carrying out the dirty sheets. Perhaps an hour or two later a trolley was brought in, the screens were removed, and the bed was made ready for the next patient.

It was a peaceful death. And yet? If I, or another patient, had been more seriously ill, or had been morbidly impressionable, is it not likely that our recovery would have been retarded by this experience? Is it too much to suggest that a private ward should be provided whenever a patient is not expected to live?

* * *

"Scott of the Antarctic" came to our local cinema last week. The evening was warm, and I went to see it clad in summer attire. But alas the ice and snow, and in fact the whole subzero atmosphere of the film, proved too much for me. Before the first hour was up I had a sore throat. The usherette selling ices in the stalls did not help matters. By the end of the evening my head was aching and nose beginning to run, and I was longing for a hot bottle, a hot drink, and a hot bath. By morning I had developed my first cold of the year. I never catch flu—apart from an occasional flea I catch nothing from my patients—but a book about the ice age, even Good King Wenceslas when I'm not prepared for him, and above all a film like "Scott" and as likely as not by next day I'm down with a cold. If I'd time I should insist that all my patients with acute coryza should recount to me all they had seen, read, or heard during the 24 hours before the attack started. But on second thoughts I won't. Numerous colds in the head are poor compensation for confirming my theory.

* * *

Some natural historian of the future, ignorant of the Royal Society of Medicine and of its Pædiatric Section, may marvel at the instinct that compelled those amiable men of science, the twentieth-century pædiatricians, at intervals to swarm like summer bees around some ancient seat of learning. For his sake it should be recorded that in June, 1949, an intense impulse directed the members of the swarm from far afield, bearing with them at least one obstetrical bumble bee, to make their way to Bristol. The hum of the assembled hive was as loud and as mellow as ever before, and the nectar that drew them was of unsurpassable merit. The participants at these gatherings pursue a ceremonial that alters little from occasion to occasion, and the ritual gestures are performed by all with relish. In this ceremonial the disembarkation from buses, the glad cries of recognition, the acceptance of printed matter, the professorial exhortation, the inspection of hospitals, the gracious shepherding, the display of cases, the display of wisdom, the lunch, the tea, the inaudible lecture, and the re-entry into buses are the recurring figures. At Bristol the paces of this formal measure were scrupulously trodden, but with such gaiety that the tune had ended before the dancers paused. The pædiatric pavane was over, and reluctantly the spell that had been wound around us was allowed to break. The buses, reappearing, swallowed up and bore off the company, but one at least, journeying in the summer twilight across the Cotswold hills, thought of the afternoon with much delight.

* * *

A. B., aged 36, was admitted for severe epistaxis. As his blood-pressure was 210/110 mm. Hg, to a simple-minded man like myself the condition seemed obvious enough. But my registrar is far from being simple-minded. A patient, he observed, must in these psycho-somatic days be approached from all angles. He had ascertained that Mrs. B. was expecting her first, and he considered our patient to be suffering vicariously from —eclampsia. Maybe I was coldly if politely critical; but, believe it or not, when A. B. exhibited considerable improvement, this, so my young colleague triumphantly assured me, had exactly coincided with madam's satisfactory delivery. So there seems after all some point in the old *Punch* joke—the obstetrician's soothing assurance to the agitated young husband, bemoaning his sufferings from suspense, that he had "never lost a father yet."

Letters to the Editor

"NORMAL DEATH"

SIR,—Dr. Walker, in his letter of May 14 on a Plan for the Aged, uses the term "normal death," and suggests that it should be our aim to make it as common as normal birth. But what is normal death?

Dictionary definitions of "normal" describe it as meaning "usual, regular, ordinary," or "the average of observed phenomena." Referring to the last-mentioned, Stephen Leacock once wrote something to the effect that the average inhabitant of Great Britain was 32·4 years of age, weighed 136·8 lb., and lived 2·3 miles NE. of Much Wenlock; if the Free State were included he lived about 7 miles out in the Bristol Channel. On the same basis I suppose a normal death would be one resulting from 0·3 parts cardiovascular disease, 0·15 parts cancer, 0·04 parts tuberculosis, 0·0002 parts violence, and so on.

If by normal Dr. Walker means senility, this surely cannot be called "usual, regular, or ordinary." A birth can be so called because it does usually conform to a common process and generally takes place at the same age, but it is a shared act. Death is singularly individual.

The elimination of all pathological processes except decay might appear desirable to the individual, but Shakespeare's seventh age is not collectively attractive. The ideal death is a matter of opinion. In spite of the Prayer Book many would vote for a sudden death or even one "facing fearful odds." My own ideal would be that of a former Lord Chief Justice who died suddenly just after he had hooked a salmon in his 91st year—enjoying himself to the end.

If we aim at the elimination of painful and troublesome disease and a *happy* old age, death no doubt will come in its own time, and we may have achieved the object of living to the extent that—in the words of Mark Twain —"When we die even the undertaker will be sorry."

Welsh Board of Health, Cardiff. R. J. MATTHEWS.

FEEDING OF PREMATURE INFANTS

SIR,—May I offer two comments on Dr. Ford's excellent article last week?

There is, I believe, a fallacy in comparing the capacity of the newborn's stomach measured post mortem with what it holds in the living child. To suppose that it is identical presumes that at the end of feeding the stomach contains all the milk the baby has taken, whereas from at any rate a few days after birth there is evidence that the pyloric sphincter relaxes almost as soon as the baby starts to feed. Thus if feeding is interrupted after the first minute or two, milk can distinctly be heard trickling into the duodenum. If there is spasm or occlusion of the pylorus, gastric peristalsis can often be seen almost immediately milk enters the stomach. This can sometimes be observed within the first week of life and I have seen it as early as the 3rd day. It is well established also that dilation of the stomach is rapid if pyloric obstruction is not quickly relieved. It would thus seem evident that the infant's stomach does not remain passive until filled "to capacity" as in the post-mortem experiment.

The "sudden change in capacity" that Scammon and Doyle found by test-weighing at the 4th and 5th days of life, to which Dr. Ford refers, does not surely represent an increase in the capacity of the stomach but coincides with the synchronising of the pyloric sphincter's relaxation and the start of feeding. It thus permits the rapid passage of food into the gut as soon as the milk's outflow from the breast increases. In some observations on a baby four weeks old, milk to which bismuth had been added could be seen in the ascending colon within 12 minutes of being swallowed; only about half an ounce appeared to be retarded in the stomach and this was still there an hour later. It is reasonable to suppose these reflex movements will develop slowly in the very premature baby, and it is desirable therefore that in the early critical days of life when food is given by tube it should be given slowly. I suspect that neglect of this precaution is not seldom productive of vomiting and so is responsible for much of the reluctance to

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employ this valuable method of feeding. If care is taken to allow, for example, 6 minutes to run in a feed of 6 drachms to a 3-lb. baby, I do not think vomiting will ever be provoked. The rate can easily be regulated by a clamp before the tube is passed.

Dr. Ford mentions the difficulty of obtaining human milk for premature babies. It need not exist. A large proportion of women yield more milk in the lying-in period than their babies can take, and removal by hand of the surplus not only gives much relief but is a great safeguard to the security of lactation. If this were regularly practised every maternity hospital could establish a milk-bank for the use of premature and sick babies in its neighbourhood. No elaborate freezing plant is needed. By far the best method I have seen is that used at University College Hospital where breast-milk is stored in ice-cream containers. From the British Hospital for Mothers and Babies we quite often supply 10–12 pints daily to children's hospitals and still have ample for our own premature infants and any whose mothers' yield may be insufficient. The balance at our bank varies and from time to time may be low; on the other hand it has happened that, with a lack of demand from outside, 25 quarts accumulated within seventy-two hours.

Finally, Sir, it is wholly wrong that the cost of breast-milk should ever prohibit its use for very premature babies or those gravely ill. There should be no need for it to travel more than a few miles, and beyond meeting the cost of transport no charge should be made for milk collected in the way and from the source described. The high price at which it is sometimes sold constitutes a veritable black market. On occasion it can save life and restore health as dramatically and as surely as can a blood-transfusion and it should be just as readily available.

London, S.E.18. HAROLD WALLER.

MEDIASTINAL EMPHYSEMA

SIR,—The reports of cases of mediastinal emphysema by Mr. MacRae and by Dr. Fridjohn and Dr. Azzopardi in your issue of May 28, prompt me to report the following additional 4 cases, 2 of which occurred during the course of pulmonary tuberculosis in adults and 2 during the course of severe measles in children.

CASE 1.—Of the tuberculous cases, the first was a boy of 15 who was admitted to Colindale Hospital from University College Hospital on Jan. 13, 1944, in an acutely febrile toxic condition. A left artificial pneumothorax (A.P.) and adhesion-section had already been performed. On March 3 acute deterioration set in and X-ray examination showed consolidation of the right lung not previously present. This was thought to be tuberculous in origin, but the sputum was found to be loaded with pneumococci, and sulphonamide treatment was instituted. His condition rapidly deteriorated; surgical emphysema gradually developed during the next few days and became extreme, involving the face, body, and limbs to such an extent that the patient, from being a thin, wasted individual, became enormously inflated. It was naturally thought that this emphysema was related to the pneumothorax on the left side, but the pressures in this were unchanged and on removal of 200 ml. of air the pressure of −23−3 cm. of water was maintained. Air could therefore only have been escaping up the mediastinum through the interstitial tissue of the right lung as a result of the acute pneumonic process. Attempts were made with Southey's tubes and later by multiple incisions to release the subcutaneous air, without any beneficial effect, and the patient died from acute respiratory failure on March 27. X-ray examination confirmed the presence of air in the mediastinal tissues.

CASE 2.—The patient, aged 48, was admitted on the night of Oct. 19, 1948, as an emergency case of "status asthmaticus." He had a history of pulmonary tuberculosis starting in 1945, which was originally treated by right A.P., which had since been abandoned. He was acutely dyspnœic and was found radiologically to have a spontaneous pneumothorax on the right side. The air gradually re-absorbed and the patient appeared to be making a complete recovery until on Nov. 25 another right spontaneous pneumothorax occurred. A Foster Carter needle was inserted and left *in situ* allowing air to escape, and in the course of the next few days extensive surgical emphysema of the neck and face up to the zygoma developed. The patient was subsequently treated with intrapleural silver-nitrate installations and by under-water catheter drainage, and recovered. He was discharged home with a fully re-expanded lung in March, 1949. In view of the fact that the parietal pleura had been perforated by the Foster Carter needle, it is possible that in this case air reached the tissues of the face by this route, although in view of its amount and its symmetrical distribution in the neck and face, the mediastinal route would seem more likely, especially as the perforation made by a Foster Carter needle is very small. X-ray examination was inconclusive on this point, although suggestive of mediastinal emphysema.

CASE 3.—A boy of 4 was admitted to the North Eastern Hospital in 1928 as a typical case of measles on the third day of the disease. Five days after admission he developed bronchopneumonia and five days later extensive surgical emphysema of the head and neck developed. There was no pneumothorax and the air could only have reached the face via the interstitial tissues of the lung following the pneumonic destruction. The emphysema gradually subsided and the child ultimately recovered.

CASE 4.—A boy of 3 was admitted to the North Eastern Hospital in 1928 with severe measles and bronchopneumonia on the fourth day of the disease. Marked surgical emphysema of the neck and head developed during the course of the next few days, no pneumothorax being present, and the patient died in this condition eleven days after admission.

Colindale Hospital, London, N.W.9. W. E. SNELL.

SUBMAMMARY NEURALGIA

SIR,—Permit me to comment on your annotation of June 4 on Cardiopathia Artefacta, and on its relation to thoracic pain. A large number of patients present themselves at outpatient departments with chest pain as the leading symptom but without demonstrable cardiac disease. To tell each of them that there is nothing amiss with the heart may alleviate, but cannot abolish, their trouble. In my opinion such pain often has an organic origin. Most laymen have the impression that the heart lies somewhere beneath the left breast, and everyone knows some of the grave consequences of severe heart disease. Hence any pain in the region of the heart arouses anxiety. But pain, I believe, is not a feature of neurosis per se. Psychogenic pain may be hysterical or hallucinatory, but not neurotic; though a neurotic patient may of course also show hysterical manifestations.

One very common source of chronic somatic pain is the spine and the spinal roots. To ascertain whether or not this is the source of "submammary neuralgia" we should (1) redissect in detail the cervical and thoracic spine with its discs, ligaments, muscles, and related spinal roots and their divisions; (2) study what normal and abnormal movements can do to these structures, and the secondary effects of local damage on movements; and (3) investigate clinical cases fully by expert radiography in the different positions of a *movable* spine. Radiography of the spine as commonly practised yields only inadequate pictures of "still life."

As long ago as 1828, Delpech [1] observed that chest pain can be produced by spinal conditions; and recently Semmes and Murphy [2] have definitely proved that lesions of the lower cervical discs give rise to such pain. Many French workers, including Ballivet,[3] have described the "posterior cervical sympathetic syndrome" of Barré-Liéou. This is characterised by headache, severe vertigo, and auditory, visual, and laryngeal disturbances. It is attributed to irritation of the vertebral sympathetic nerve and hence of the vertebral artery and its distribution in the brain-stem. Ballivet reports a case cured by cervical laminectomy and the freeing of arachnoid adhesions. Statistically significant evidence exists of a relation between cranial and spinal-root lesions and malignant hypertension.[4] The latter condition was present in 10 out of 50 subsequently fatal cases of the Landry-Guillain-Barré syndrome.

1. Delpech, J. *Orthomorphie*, 1828, ii, 10. Cited by Coote, H., *Brit. med. J.* 1858, p. 1017.
2. Semmes, R. E., Murphy, F. *J. Amer. med. Ass.* 1943, **121**, 1209.
3. Ballivet, M. J. *J. Méd. Lyon*, 1947, **28**, 605; *Rév. Neurol.* 1948, **80**, 35.
4. Haymaker, W., Kernohan, J. W. *Medicine, Baltimore*, 1949, **28**, 59.

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It was inspiring to read Mr. J. H. Kellgren's erudite article of June 4 on deep pain, and then to read, in his summary, the humble statement that we know very little about deep pain. It is clear that in some directions we have a long way to go before we can truly say "The labour we delight in, physics pain."

London, N.4. I. H. MILNER.

AMPHETAMINE IN DERMATOLOGY

SIR,—I would like cautiously to confirm Dr. Carslaw's observations, in your issue of May 21, on the value of this type of drug in dermatology; but it should only be used in carefully selected cases.

I have obtained the best results in oldish patients with long-standing widespread eczema; many of these are very depressed and seem to have given up any effort to get better. 'Benzedrine' or some similar drug seems to give them new life and its administration is often followed by marked improvement in their clinical condition. One of the most striking cases I have observed was that of an elderly man, who rarely spoke, with the type of condition described above. One of my colleagues decided to use him to illustrate the relation between depression and chronic skin diseases. Unfortunately I put him on benzedrine in the interim, and I was told he spoiled the demonstration by talking all the time, while his skin was already greatly improved, much to my colleague's amazement until he was informed about the benzedrine.

Skin patients are often depressed by the large amounts of phenobarbitone which they take, and a morning dose of benzedrine may greatly increase their sense of well-being; it is also of value in counteracting the depressing side-effects of anti-histamine drugs. I need hardly add that it should not be used in such a way as to interfere with the patient's sleep.

Leeds. F. F. HELLIER.

ANURIA FOLLOWING ISCHÆMIA OF THE RENAL CORTEX

SIR,—We have read with interest the report of June 4 by Dr. Solymoss upon a parturient woman who died after eclampsia and anuria lasting 7 days and in whom necropsy revealed symmetrical ischæmia of the renal cortex. We have recently treated with success a clinically similar case.

A primigravida, aged 28, who was thirty-four weeks' pregnant, was admitted as an emergency to the maternity wards of the Royal Victoria and West Hants Hospital, on May 17. She had been attending our antenatal clinic since the tenth week of her pregnancy and had last been seen two weeks before admission. There had never been albuminuria or œdema and the highest blood-pressure readings had been 136/86 mm. Hg.

On admission she complained of severe frontal headache and blurred vision. Labour pains had just started and she had not felt fœtal movements for 12 hours; she had not passed urine for several hours. She looked extremely ill and pale; her blood-pressure was 180/120 mm. Hg; hæmoglobin 64%; there was moderate œdema of her ankles and back, and the bladder contained 1 ml. of turbid urine which boiled solid. Uterine contractions were present; the fœtal heart could not be heard, but the uterus was neither tense nor tender between the contractions. Sedatives—morphine, soluble phenobarbitone, and pethidine—were given, and she was delivered 12 hours after admission of a stillborn baby, weighing 3½ lb., immediately followed by the placenta and a dark blood-clot the size of a tangerine, fitting into a depression in the centre of the placenta. There was no further hæmorrhage. A diagnosis of "concealed accidental hæmorrhage probably associated with symmetrical cortical necrosis of the kidneys" was made.

For 48 hours she was desperately ill and vomited copiously. In spite of a continuous intravenous drip of isotonic sodium sulphate, alternating with 5% glucose in normal saline (total daily intake 2 litres) the urinary output was under 1 oz. on the first day and only 2 oz. on the second. The blood-urea rose to 153 mg. per 100 ml.

In order to restore the cortical renal circulation, it was decided to block the sympathetic supply to the kidneys, which is mainly derived from the spinal segments D 6–11. Spinal analgesia was contemplated but rejected because it was felt that a precipitate fall in blood-pressure would ensue, with the result that, although the cortical ischæmia might be corrected, the glomerular-filtration pressure would be so reduced that no ultimate advantage would be gained. Upon further consideration it was decided that the necessary sympathetic block would best be achieved by a limited epidural analgesia, which it was hoped would not depress the blood-pressure unduly. Accordingly the epidural space between D 8 and 9 was tapped and 15 ml. of 1 : 600 cinchocaine hydrochloride ('Nupercaine') slowly injected. The result was dramatic: very little fall in blood-pressure occurred (152/90 mm. Hg) and within a few hours 17 oz. of urine was excreted, followed by 35 oz. the next day.

In view of the patient's pallor, 1 pint of compatible blood was transfused on May 21 and 2 further pints on the following day. The urinary output rose to 92 oz. on May 23 and 119 oz. on May 24. Her hæmoglobin was 50% on May 23 and 56% on May 27. (The comparatively high hæmoglobin reading on admission may be explained by hæmoconcentration due to the shocked condition.)

The blood-urea, estimated every 3 days, has been steadily falling and at present (June 6) is 48 mg. per 100 ml. Vomiting has ceased; her general condition is good; there are no headaches; the vision is clear; the diuresis is satisfactory, and the urine free from albumin. The blood-pressure is still elevated (160/100 mm. Hg).

We have no doubt that the pathology of this case is the same as in Dr. Solymoss's—namely, ischæmia of the renal cortex due to local diversion of the cortical blood-flow (Trueta's "subcortical vascular shunt"). This appears to be proved by the effect of the epidural block in our patient. In addition, there was anæmia in both cases (hæmoglobin 33% in Dr. Solymoss's case), and this general factor may have materially contributed to the production of oliguria by causing renal anoxia.

With our present knowledge the rational treatment of these cases of "threatening symmetrical cortical necrosis" appears to be epidural block, blood-transfusion, and continuous intravenous infusion.

N. ALDERS
Bournemouth. S. F. DURRANS.

SIR,—The article by Dr. Solymoss in your issue of June 4 would seem to establish, as the author suggests, the "reasonable certainty" that the medullary shunt of the intrarenal circulation described by Trueta and his co-workers does operate in man.

It seems strange that the existence in man of this mechanism has taken so long to gain a hold in the mind of the clinician: for it sheds a flood of light on the operative pathology of many forms of anuria and on renal physiology in general. In man the forms of anuria with which the medullary shunt appears to be directly connected are: (1) that in association with the crush syndrome; (2) that accompanying septic abortion; (3) that in eclampsia, as demonstrated by Dr. Solymoss; and (4) that occasionally following a straightforward prostatectomy in an uninfected patient, and that observed after perforation of the bladder-base with the diathermy loop of the resectoscope during transurethral resection of the prostate.

These are all forms of anuria which in the past, apart from odd, unexpected recoveries, have been fatal. It would appear, however, that the renal shunt is eminently reversible, as is emphasised by Dr. Solymoss's finding that even after seven days of complete anuria and relative cortical ischæmia, cortical necrosis had not occurred. In the rabbit, Trueta and his colleagues found that division of the great splanchnic nerve caused immediate reversal of the shunt, and it may well be that a similar process takes place in man. This may seem an unduly drastic procedure in an already ill patient, but surely it is no more drastic than decapsulation of the kidneys; probably the only cases of anuria where the latter operation can be logically defended are those following incompatible blood-transfusion, when the kidney appears to be under great internal pressure.

Birmingham. MAXWELL KENT.

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GRADING

SIR,—The title of your June 4 leading article, The Disappointed, should rather, we think, have been The Frustrated.

It is generally recognised that the highest standards are demanded of the specialist, and there could be no complaints if such standards had been the universal basis of assessment. But study of some individual assessments in this region makes it clear that this principle has not been consistently followed. In some cases relatively young practitioners, with little experience and no known outstanding professional attainments, have been recognised as specialists, whilst older men with greater experience and attainments, who for many years have been regarded by their colleagues as specialists have been graded senior hospital medical officers—or even as junior hospital medical officers!

It is true that no satisfactory definition of specialist status has ever been evolved. In all attempts to arrive at such a definition, the ultimate criterion has been the opinion of professional colleagues. This principle was accepted by the Minister in his instructions to assessment committees. The members of the assessment committees are not colleagues, have no personal knowledge of many of the practitioners they judged, and had only the scantiest information about them. In our view, assessment on a purely regional basis can be neither just nor equitable. The proceedings of the assessment committees are only less secret than those of the War Cabinet. Surely it is not unreasonable to request that applicants be informed of the reasons for their down-grading?

Regardless of remuneration, specialists cannot accept the grading of senior hospital medical officer. Originally, this status was meant for would-be specialists who had failed to make the grade. It is clear, however, from the terms and conditions of service for hospital staffs released last week that not only is this not true, but, even worse, the senior hospital medical officer is to perform the specialist's duties without his status.

Since the publication of your leader, it has been disclosed that for the purpose of hearing appeals the committees will be augmented by two outside members. But this attempt to disarm criticism is clumsy. The outside members are even less likely than the original members to have personal knowledge of the applicants, and in any case they will be outvoted.

HOSPITAL MEDICAL STAFF COMMITTEE.

SIR,—We are the residents of a south-east London hospital. We have just been graded and we cannot make head or tail of it.

One of our resident medical officers with a higher qualification, who periodically acts for the medical superintendent and for the medical specialist, has been graded junior hospital medical officer, like our most junior casualty officer. All medical ex-Service trainees have been graded "class-3 trainees" while their surgical counterparts, as well as registrars, have *all* been graded class 2, apparently irrespective of age, experience, qualifications, and war service.

All this does not make sense to us, for we do not know (1) what the criteria of classification were; (2) the constitution of the committees; and (3) whether our chiefs had any say in the matter. We are puzzled and bewildered.

The situation could, we think, be improved to a certain extent (*a*) if the criteria of classification and the composition of the grading committees were made known; (*b*) if the resident staffs of the hospitals concerned had representatives on the committee; and (*c*) if every individual or at least every hospital were given some reasons for the classification. If these suggestions were followed, some would probably still have their own personal grievance, but at least the present atmosphere of distrust and cynicism would be dispelled.

THIRTEEN RESIDENTS.

SIR,—In the 22 years since qualifying I have been one of those who never write letters to the journals. I find myself so stirred, however, by your leading article of June 4, The Disappointed, that I write now and may be voicing the feelings of many others.

Perhaps tomorrow's post may bring me news of my grading as a specialist, or many posts may come and go before I hear. But will the verdict of my brothers on the reviewing committees make me a better, or worse, doctor? If I am lucky, can I leave the disappointed to their fate? No, Sir! Surely, what we can give is more important than what we are to get, and how we stand together more vital than how we divide ourselves up. Your article suggested defeat as well as disappointment. Could not your next be entitled The Undivided?

Exeter. H. S. GAUSSEN.

SIR,—I was interested recently to find a well-known writer[1] who, discussing Lord Acton's views on democracy and its attitude to the individual, emphasised that famous historian's words by stating that no man or group of men should have power to decide what another man's status ought to be; this condition of freedom being held as absolutely essential.

The grading of medical personnel, although temporary and expedient, would appear to be, therefore, a dangerous precedent. Moreover, is not the grading of the "posts" of the new establishment all that is really needed? The holders or applicants would be either of the required standard or not, as the case might be.

Manchester. F. S. A. DORAN.

"FOOLPROOF" BLOOD-TRANSFUSIONS

SIR,—Blood-transfusion is ordinarily considered a simple and safe procedure but the article, by Dr. Doyle and Dr. Frodsham, and the annotation in your issue of April 30 should remind physicians that this procedure has caused the death of patients with relatively benign ailments from which they could have recovered if only left alone.

Since transfusions in our day are prescribed almost as freely as intravenous saline, the procedure should be made as foolproof as possible. Our experience has taught us that for every mistake caused by technical difficulties there are at least ten mistakes of a clerical nature. Thus the excellent work of a highly trained technical staff can be nullified if adequate precautions are not taken against mistakes caused by sheer carelessness. At our clinic, where more than 4000 transfusions are given every year, at least a dozen dangerous reactions traceable to such careless human errors have occurred in the past five years; luckily all the patients survived without grave sequelæ so that there were no serious repercussions. Meanwhile, however, our list of "don'ts" has increased. Considering that aside from our natural desire to benefit rather than harm our patients, there is the practical consideration that a transfusion accident may result in a costly lawsuit for physician and hospital, it occurred to me that others might benefit from the lessons we have learned from our mistakes. Therefore I am submitting the following list of precautions which we have accumulated during the years.

Precautions in Blood-grouping Laboratories.—All grouping tests must be carried out with high-titre anti-A, anti-B, and anti-rh sera. In our laboratory the sera are not coloured because we find that the use of colours as an additional identification does not help, but instead leads to mistakes; after a while the technician begins to rely on memory of the colour scheme and neglects to read labels. The set-up should be such that the technician is compelled to read the labels on the bottles in order to avoid interchange of typing sera. Also every blood should be grouped by testing the patient's serum against known cells as well as the patient's cells with known antisera. Finally, to guard against errors when recording the grouping results—e.g., writing "A" while thinking "O"—Dr. Lester J. Unger (Director, Blood Bank, New York University Bellevue Medical Center) has devised a system using triple labels serially numbered which have printed on them "group O," "group A," "group B," or "group AB," as the case may be. He also has "rh positive" and "rh negative" printed labels. When the patient's group is determined, one label from a set of the proper blood-group is pasted on to the bottle of blood, a second on to the pilot tube,

1. Hayek, F. A. Individualism and Economic Order. London. 1949.

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and a third on to the record. In this way all need for writing is eliminated.

Cross-matching should be done with blood drawn from the bottle itself rather than with blood from the pilot tube. The blood in the bottle should be regrouped immediately before the transfusion is given. Once the bottle has been entered it must be considered infected, so that if the transfusion is cancelled the blood should be used for another patient within a few hours, or discarded and not replaced in the blood-bank. If a stand-by donor is ordered, the blood in the pilot tube should be used for the cross-matching in order not to spoil the blood, in case the transfusion is cancelled. Such stand-by bloods are identified by a special tag with the patient's name on it, but no blood is released from the bank until the transfusion is actually ready to be given.

When blood becomes outdated the bottle must immediately be emptied. In a case that recently occurred at our hospital, the day-technician placed some outdated blood on a lower shelf of the refrigerator to be discarded later when she had a chance to make the necessary record; the night-technician failed to read the label and released the blood, and the patient receiving the blood became jaundiced but otherwise, luckily, had no serious reaction.

Precautions when Administering Blood.—In emergencies nurses have been known to pick up a bottle of blood without reading the label, and harried anæsthetists or transfusionists relying on the nurse have transfused their patients with blood intended for a different patient. To avoid such blunders, we have recently had tags printed to attach to the bottle after the cross-matching tests are completed. The technician prints in the patient's name and signs the upper half of the tag which bears the legend "Compatibility test O.K. for patient....., Signed....." The person administering the blood must detach the bottom half of the tag and glue this to the chart after printing the patient's name and signing the tag in the proper place in the legend "Blood administered to....., Signed....."

As for administering the blood, any method which subjects the patient to the danger of air-embolism must be condemned, even in the hands of a skilled transfusionist. If blood must be administered rapidly, instead of increasing the air-pressure in the bottle one can attach a three-way stop-cock at the lower end of the tubing and connect this in turn to the cannula in the vein and then pump the blood in by syringe at any rate desired.

In one case that came to our attention the patient had a severe reaction which we traced to heavy infection of the blood transfused. Upon investigation we found that an interne had attached a rubber bulb to the bottle to increase the air-pressure and speed up the transfusion; but some of the blood had been aspirated into the unsterile bulb and forced back into the bottle.

Apparently, it is not universally recognised that overheating or freezing blood can cause hæmolysis. We prohibit warming the blood before administering it, lest it be overheated; it is far safer to administer the blood while cold. When blood is shipped, it should be packed in ice to keep it cold, but the use of dry ice or other freezing mixtures is forbidden.

With regard to exchange transfusions when treating erythroblastotic babies, the procedure should and can be safe and sane. If properly carried out, the operation entails no mortality, as shown by our own experience with more than 65 cases using the saphenous-vein radial-artery method. Moreover, since we adopted the procedure of prophylactic injection, through the cannula into the vein, of 10% calcium gluconate 1 ml. for every 100 ml. of blood transfused, there has been no operative morbidity even when 1000 ml. of blood are given within the space of 80 minutes. The use of umbilical catheters should be condemned because this method is blind and therefore not foolproof; in fact, using this technique, there have been operative deaths traceable to air-embolism, thrombosis with gangrene of the intestines, peritoneal bleeding, or acute cardiac dilatation. By the umbilical-catheter method, in which blood is introduced and withdrawn through the same cannula, there is a danger of removing some of the blood just introduced before it has had a chance to mix thoroughly with the baby's blood. Thus, Raska describes such a transfusion which he performed in which 750 ml. of blood was exchanged yet only a 70% replacement was achieved instead of the calculated 95%. This baby developed kernicterus from which it died at the age of 3 months.

Finally, there have been instances in which individuals advocating the umbilical-catheter method had to abandon the transfusion because of inability to catheterise the vein properly, while we have found it possible always to carry out the radial-artery saphenous-vein technique. As long as the radial-artery saphenous-vein method proves safe and effective there is no excuse for using more dangerous and less reliable methods.

Unmodified Blood versus Citrated Blood.—Some transfusionists still advocate the transfusion of unmodified blood with the aid of a syringe-valve apparatus or rotary pump instead of citrated blood administered by the gravity method. However, the transfusion of unmodified blood is far from foolproof, and unless the operator is skilful more blood may be splattered on the floor, wall, and operator than is introduced into the patient. The method carries a definite danger for the recipient and a certain element of danger even for the donor. In order to prevent coagulation the blood must be transfused very rapidly with resulting abrupt increase in the patient's venous pressure; and a substantial number of deaths due to acute cardiac failure have been caused by such transfusions. Moreover, owing to leakage of valves or inadvertent reversal of the direction of flow, infections have, with this technique, been transmitted from the patient to the donor. Since citrate has proved perfectly innocuous in the amounts used for transfusions, and since citrated blood can be introduced as slowly as desired by the drip method, there is no longer any excuse for using the dangerous techniques necessary for transfusing unmodified blood. If for any reason stored blood is objectionable, fresh blood can be drawn from donors into citrate and immediately transfused into the patient. Such fresh citrated blood has all the therapeutic qualities of unmodified blood.

When bleeding donors the blood should be collected by the gravity method by inserting an extra needle into the rubber stopper of the bottle to produce an air-vent. The vacuum method is not foolproof since the vacuum may be lost before the transfusion is completed. When the vacuum is lost, moreover, a positive pressure may build up in the bottle, causing blood or even air to run back into the donor's vein.

It is impossible to list here all the precautions necessary for a "foolproof" transfusion, but these seem to be the most frequent causes of accidents.

Blood Transfusion Division, Jewish Hospital of Brooklyn, New York. A. S. WIENER.

EPIDEMIOLOGY OF POLIOMYELITIS

SIR,—It is difficult to understand why Dr. Hargreaves, in his account (June 4) of the 1947 epidemic in Cornwall, should conclude that the "24-hour flu" he describes is not abortive poliomyelitis. The symptoms are typical of abortive poliomyelitis. The virus has been repeatedly recovered from the stools [1] and from the nasopharynx [2] of such cases, which have been shown to be responsible for the spread of paralytic infection.[3] Furthermore "24-hour flu" seems to have formed an important link in the spread of poliomyelitis in the North Tamerton outbreak. It is a sound general rule in medicine never to proffer a dual pathology where one will suffice.

Dr. Hargreaves's findings in the North Tamerton outbreak are of particular interest, suggesting, as he says, a milk-borne infection. The following criteria by which a milk-borne epidemic may be recognised have been laid down in THE LANCET [4]: (1) epidemiological or bacteriological evidence that the disease in question is transmissible by milk; (2) suddenness of onset; (3) a milk-supply common to the preponderating majority of the earlier cases; (4) the presence of a sufficiently large community of persons who are not consumers of the milk to serve as controls; (5) the absence of any obvious

1. Ward, R., Horstmann, D. M., Melnick, J. L. *J. clin. Invest.* 1946, **25**, 284.
2. Paul, J. R., Trask. J. D. *J. exp. Med.* 1932, **56**, 319.
3. Merrilees, C. R. *Hlth Bull. Publ. Hlth Dept. Victoria*, 1937, **51**, 1414. Sweetnam, W. P. *Brit. med. J.* 1948, **i**, 1172.
4. Leading article, *Lancet* 1927, **ii**, 1190.

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link, other than the milk-supply, between the earlier cases; (6) an unusual age-distribution of the cases; and (7) the demonstration of a source from which the milk might have been contaminated. Dr. Hargreaves's description of this outbreak fulfils at least five of these exacting criteria; and a more detailed analysis of his findings would probably show that all are satisfied. The abrupt termination of the outbreak when farmer A's milk was pasteurised is further important evidence.

Surely the fact that poliomyelitis and tuberculosis—probably the two most deadly diseases which attack our children and whose prevention is notoriously difficult—may be milk-spread presents an unanswerable case for the immediate and compulsory pasteurisation of milk-supplies. The country-wide pasteurisation of milk would appear one of the easiest and most dramatic methods by which the Minister of Health could fulfil his statutory obligations "to promote the establishment in England and Wales of a comprehensive health service designed to secure improvement in the physical and mental health of the people of England and Wales and the *prevention*, diagnosis, and treatment of illness."

Hope Hospital, Pendleton, Salford. W. P. SWEETNAM.

SIR,—I read Dr. Hargreaves's paper with great interest. But surely the cases of "24-hour flu" described in the North Tamerton outbreak should be regarded as abortive poliomyelitis? Clinically, in the first place, the syndrome of headache in 80% and diarrhœa in 15% is not like infective gastro-enteritis, but is exactly what is found in abortive poliomyelitis; the occurrence of twitching in one case is even more suggestive of the latter disease. In the second place cases of paralytic poliomyelitis in a semi-closed community, such as an isolated village, are extremely likely to be accompanied by abortive cases; moreover one would expect these considerably to outnumber the paralytic cases, and to show an attack-rate higher in children than adults, as in fact did occur in this outbreak. Finally, while the distribution of cases in relation to milk-supply is suggestive of a milk-borne infection, the spacing in time over twenty days is less so, and is, to say the least, compatible with case-to-case transmission. In one case (that of the boy from Launceston) there appears to have been no alternative to the latter route.

Shrewsbury. J. C. RYLE.

SCORPION STINGS

SIR,—I read with interest the letters on this subject by Mr. Dewey and Dr. Martin (April 30 and May 14).

I can now understand how grandmothers in this country immunise their grandchildren against scorpion stings. A young scorpion is killed by drowning in ordinary drinking-water in a coffee-cup (1 oz. capacity). The infant is immunised by the administration of the water in which the young scorpion was drowned, in doses of one teaspoonful daily. It is believed that if a baby immunised in this way is ever stung by a scorpion no pain or harm will follow.

DJAMIL FAÏK TUTUNJI
Amman, Transjordan. Under-Secretary of State for Health.

Public Health

Infectious Diseases

Smallpox.—The date of onset of the last case notified in England and Wales was May 16. This patient, an unvaccinated close contact, had been admitted to hospital, as a precaution, on May 7. After this interval, it is assumed that the country is again free from smallpox.

Typhoid Fever at Fulham.—3 cases, with onsets at the end of May, have been notified, and the disease is suspected in 3 other patients. The source of infection is under investigation.

Paratyphoid Fever on Tyneside.—15 cases of Vi-bacteriophage type 3A paratyphoid infection are believed to have been infected by a confection manufactured in Jarrow and consumed about the middle of May. The patients resided in four sanitary districts. The circumstances suggest that the outbreak was self-limiting and further cases are not expected.

Obituary

JOHN HENDERSON

M.D. GLASG., F.R.F.P.S.

Dr. John Henderson, consulting physician to the Glasgow Royal Infirmary and a former president of the Royal Faculty of Physicians and Surgeons of Glasgow, died on June 1 at the age of 72.

The son of John Henderson, of Burnside, he was educated at Allan Glen's School, and Glasgow High School and University. After graduating M.B. in 1898 he held house-appointments at Glasgow Royal Infirmary and Maternity Hospital, and in 1901 he received the degree of M.D. with commendation. The following year he joined the staff of the Glasgow Royal Infirmary, later becoming an honorary lecturer in clinical medicine in the university. In 1910 he was elected F.R.F.P.S., and after two years as assistant to the Muirhead professor of medicine he was, in 1913, appointed to the chair of medicine in St. Mungo's College, which he held till he retired in 1947. In 1914 he was appointed full physician to the Royal Infirmary. During the 1914–18 war he served at first as a civilian medical specialist in a military hospital, and later with the rank of major in the R.A.M.C. he saw service in Salonika and France.

A popular teacher, his gift of lucid exposition was appreciated both by students and nurses for over 40 years, and even after formal retirement he continued to lecture to dental students. Part of his success was perhaps due to the friendly interest which he took in his students' problems both inside and outside the lecture-room. His textbook on *Medicine for Nurses* appeared in 1921, and he also edited several editions of *Wheeler and Jack's Handbook of Medicine*. Dr. Henderson was for many years an examiner for the University of Glasgow, the Triple Qualification, and the fellowship of the Glasgow Faculty, over which he presided from 1937 to 1939. He took part in the negotiations with the university on the position of the extramural schools, and his *Position of Extramural Teaching in Glasgow* appeared in 1928.

Dr. Henderson married Miss Jenny Martin, and they had a daughter and a son, Dr. Ian Henderson.

CHARLES CROMHALL EASTERBROOK

M.D. EDIN., F.R.C.P.E.

Dr. C. C. Easterbrook, who died in Edinburgh on June 5, at the age of 82, was for almost thirty years physician-superintendent of Crichton Royal, Dumfries.

Born at Bellfield, Midlothian, the son of Thomas Ford Easterbrook, he was educated at George Watson's College and the University of Edinburgh. After taking his M.A. in 1887 with a Grierson and later a James Scott scholarship he turned to the study of medicine, and in 1892 graduated M.B. with first-class honours. During his last year as a student he was elected president of the Royal Medical Society. Having held house-appointments at the Royal Infirmary and other Edinburgh hospitals he decided to specialise in mental diseases and he became junior assistant physician at the Royal Edinburgh Asylum under Thomas Clouston. While holding this appointment he obtained in 1897 the diploma of the Royal Medico-Psychological Association, and in 1900 their bronze medal, open to competition among the assistant physicians of British asylums for a prize essay. In the same year he was also awarded his M.D. degree with honours. In 1902 he was appointed superintendent of the Ayr district asylum, a post he held till in 1908 he moved to the Crichton Royal.

Of this his life's work, a former colleague writes: "Easterbrook was a man of prodigious energy and methodical thoroughness and applied himself to his task with scientific method and determination. In consequence the hospital flourished under his administration in a remarkable way. His era preceded the introduction of shock therapies and yet his treatment, of which he has left perfectly documented statistics, was highly successful. An early advocate of open-air treatment for mental disorder, he promoted work, sport, and recreation as remedial agents long before occupational

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and recreational therapy became familiar words. He knew all his staff and patients by name and took personal interest in each one so that he was beloved by all. He was never idle yet he found time to perform with genuine modesty innumerable little kindnesses.

"Dr. Easterbrook was a man of unusually wide interests. At once ornithologist, meteorologist, expert on antique furniture, photographer, and all-round sportsman, he was also a keen gardener, and the Crichton grounds and gardens owe much of their charm to his love of nature and lively interest in the layout of the estate. During his tenure of office a vast building programme was carried out costing about £310,000. The buildings are generously equipped with open-air verandahs, and the splendid recreational and therapeutic centre, named Easterbrook Hall, is a fitting memorial to his wisdom and foresight."

Dr. Easterbrook's Morison lectures to the Royal College of Physicians of Edinburgh, published under the title of *Mental Invalids* in 1925, were among the most important of his writings. The first three years of leisure after he retired in 1937 he gave up to compiling his monumental *Chronicle of Crichton Royal* which relates year by year the development of the hospital. He is survived by his wife, son, and daughter.

Births, Marriages, and Deaths

BIRTHS

ACKNER—On June 11, at Bromley, Kent, the wife of Dr. Brian Ackner—a son.

AMBROSE.—On June 5, in London, the wife of Dr. Gordon Ambrose—a son.

DENNISON.—On June 7, at East Grinstead, the wife of Dr. E. J. Dennison—a daughter.

HORSLEY.—On June 4, at Wimborne, the wife of Dr. J. Stephen Horsley—a son.

HUTTON.—On June 8, in London, the wife of Dr. A. M. Hutton—a daughter.

JACKSON.—On June 5, at Oxford, the wife of Dr. C. R. S. Jackson—a son.

KUNKLER.—On June 6, at Hitchin, the wife of Squadron-Leader P. B. Kunkler, M.R.C.P.—a son.

LANE ROBERTS.—On May 21, at Oxford, the wife of Mr. P. A. Lane Roberts, F.R.C.S.—a son.

LAURANCE.—On June 9, at Kettering, the wife of Dr. B. M. Laurance,—a son.

MCVICKER.—On June 3, the wife of Colonel D. McVicker, O.B.E., M.C., F.R.C.S., Belfast—a son.

PARKINSON.—On June 8, in London, the wife of Mr. Roy Parkinson, F.R.C.S.—a son.

RAWLINS.—On May 31, at Valetta, Malta, the wife of Surgeon Lieutenant J. S. P. Rawlins—a son.

REED.—On June 2, in London, Dr. Freda S. Reed (née Mackover) wife of Mr. Ralph Reed—a son.

ROGERSON.—On May 30, at Whitchurch, Shropshire, Dr. Evelyn Rogerson (née Williams) wife of Dr. Gerard Rogerson—a son.

ROWLANDSON.—On June 8, in London, the wife of Mr. Richard Rowlandson, F.R.C.S.—a son.

RUTTER.—On June 7, the wife of Mr. Timothy E. Rutter, F.R.C.S.E., Portscatho, Cornwall—a son.

SMITH.—On June 7, in London, the wife of Dr. Redmond Smith—a son.

TURNER.—On June 2, at Northampton, the wife of Dr. F. L. Turner—a daughter.

WAY.—On June 8, in London, the wife of Flying-Officer Stephen P. B. Way, M.R.C.P., R.A.F.—a son.

MARRIAGES

DE VINE—LACKENBY.—On June 1, at Chippenham, Wiltshire, James Gerald Brennan De Vine, M.C., M.R.C.S., major, R.A.M.C., to Beryl Patricia Lackenby (née Collingwood).

SEQUEIRA—GRAHAM.—On June 2, at Northover, Ilchester, Peter James Littlejohns Sequeira, M.B., to Mary Graham.

WILLIAMS—MOORCROFT.—On June 4, at Loughton, Hugh Emrys Williams, M.B., of Norwich, to Gladys Olive Moorcroft, of Loughton.

DEATHS

COWAN.—On June 9, at Lincoln, Alister Forbes Cowan, M.B. Edin., F.R.C.S.E., aged 62.

EASTERBROOK.—On June 5, in Edinburgh, Charles Cromhall Easterbrook, M.A., M.D. Edin., F.R.C.P.E., aged 82.

FERRIER.—On June 8, at Swanage, Dorset, David Hynd Ferrier, M.D. Edin.

FOX.—On June 1, Campbell Tilbury Fox, M.R.C.S., of Littlestone, Kent, aged 77.

GIBSON.—On June 4, at Emsworth, Hants, Henry Wilkes Gibson, M.B. Lond., aged 81.

MCGRATH.—On June 2, at Staines, Middlesex, John Joseph McGrath, M.D. N.U.I.

ROUTH.—On June 6, at Bridgwater, Somerset, Randolph Henry Felix Routh, M.R.C.S., aged 87.

SHARP.—On June 6, at Okehampton, Christopher James Lewen Sharp, M.C., M.B. Camb.

THWAITES.—On June 10, at Ashtead, Cyril Evered Thwaites, M.R.C.S., aged 74.

Notes and News

ASSOCIATION OF CHILD PSYCHOTHERAPISTS

THE working party convened last year, under the chairmanship of Dr. Kenneth Soddy, to formulate proposals for establishing a recognised professional discipline of child psychotherapy (non-medical) has agreed on the structure of a proposed new professional organisation, and on the scope and content of a training scheme for new entrants. A meeting, at which the association is likely to be launched, is to be held at 39, Queen Anne Street, London, W.1, at 3.30 P.M. on June 25.

Membership, it is proposed, shall be open to those who have successfully completed a recognised course of training, though for the first three years those who have not taken such a course but are already working in the field of child psychotherapy will be eligible. The training course, says the working party, should be spread over three years, and should be comparable in standard and quality with postgraduate courses conducted by universities; and the hope is expressed that in the future these courses will be recognised and conducted by universities. Candidates for admission must hold an honours degree in psychology or its recognised equivalent, or an honours degree in arts or science and an appropriate postgraduate diploma in psychology; but for the next five years the certificate in mental health, or certain high qualifications in fields other than psychology together with special experience and aptitude, may be accepted. Candidates must also have had at least twelve months' continuous practical experience with children; and they will be required to satisfy a selection committee of their personal suitability for training.

MEASLES PROPHYLACTIC SERUM

ACCORDING to the Ministry of Health, there seems to be some misunderstanding about the method of obtaining anti-measles serum. Doctors wishing to obtain a supply should not prescribe it on form E.C.10, but should apply to the nearest Public Health Laboratory. The address of the appropriate laboratory can be had from the medical officer of health.

REPORT ON INSECTICIDES

THE W.H.O. expert committee on insecticides, meeting last month in Cagliari, Sardinia, declared that D.D.T., as commonly applied for residual spraying, is harmless to man and mammals, and deplored rumours to the contrary. The committee concluded that the best and safest method of keeping a territory free of malaria is for a regular insect-control service to be set up after the initial eradication process is completed. This will destroy not only intruding mosquitoes but house-flies and other undesirable insects. However, since flies sometimes become resistant to D.D.T., it may be necessary after a year or two to switch to benzene hexachloride (B.H.C.) or some other insect-killer.

A PATIENT TO WATCH FOR

AFTER consulting the police, Dr. J. Burnford has informed us of the following case in which a patient has lately discharged himself from at least five hospitals within a few days of admission.

The man, saying that he is Leonard Bradford, aged 41, of Vauxhall Bridge Road, or Vauxhall Road, Westminster, gives a history of a fit or an attack of unconsciousness, and he complains of diplopia; his speech is slurred and the pupils are eccentric. Sometimes he presents with a spastic right limb and sometimes with a coarse tremor. He wrongly states that 2–3 years ago his condition was diagnosed as encephalitis at the West London Hospital by Dr. Burnford.

Any hospital harbouring this man should, it appears, inform the police.

MEDICAL INSURANCE AGENCY

THE 21st annual meeting of the Medical Insurance Agency was held on June 1. The report of the committee of management for 1948 disclosed another successful year. Grants to the principal medical and dental charities were sanctioned, amounting in all (by use of the covenant system) to close on £14,000. Progress in all branches of the agency's business in 1948 was considerable, though the figures for new life business were somewhat below the exceptionally high total of 1947. Branch offices have been opened in Leeds and

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Manchester. The full impact of the National Health Service upon the needs of the medical profession has not yet been felt; but the special facilities which the agency is now able to negotiate for loans towards the purchase of houses, cars, or equipment have already been widely used and have replaced loans for the purchase of practices. Lord Horder, Sir Henry Tidy, Dr. Alfred Cox, Dr. James Fenton, Mr. A. M. A Moore, and Mr. R. W. Raven were re-elected to the committee for three years; and Dr. Oliver Scott was elected to replace the late Dr. J. W. Bone. Dr. Fenton was re-elected chairman and Dr. Henry Robinson hon. secretary.

University of Oxford

On June 4 the following degrees were conferred:

B.M.—P. S. Buckley.
D.M.—P. S. Buckley, E. H. Brown.*

* In absentia.

Scholarships of the value of £250–350 per annum, are now to be awarded each year by the board of the faculty of medicine to students who are taking their medical degree either at Oxford or in one of the Dominions, and who intend to complete their clinical studies in the Oxford medical school.

University of London

Mr. G. A. D. Haslewood, D.SC., has been appointed to the university chair of biochemistry at Guy's Hospital medical school from Oct. 1.

Royal College of Surgeons of England

At a meeting of the council held on June 9, with Lord Webb-Johnson, the president, in the chair, the honorary medal of the college was presented to Mr. Arthur Sims, Prof. F. Wood Jones, F.R.S., and Prof. W. E. Gye, F.R.S. A certificate of honourable mention for his Jacksonian essay was presented to Mr. C. G. Rob.

The following were coöpted to the council for 1949–50:

Dr. Guy Dain (general practice), Mr. J. M. Wyatt (gynæcology and obstetrics), Mr. V. E. Negus (otolaryngology), Mr. A. D. Marston (anæsthetics), Mr. J. H. Doggart (ophthalmology), Mr. R. V. Bradlaw (dental surgery), Mr. B. W. Windeyer (radiology).

The following examiners were appointed:

Fellowship.—Ophthalmology: Dr. S. P. Meadows. Anatomy, Mr. E. C. B. Butler, Prof. James Whillis, Mr. P. H. Mitchiner: Prof. Thomas Nicol. Applied Physiology and Pathology: Prof. J. H. Dible, Prof. W. R. Spurrell, Prof. D. T. Harris, Prof. Theodore Crawford.

Diploma of L.R.C.P., M.R.C.S.—Elementary Biology: Mr. J. H. Elgood, Mr. Alan Fisk, Mr. Frederick Segrove, Mr. A. G. Hamilton. Anatomy: Mr. A. M. A. Moore, Prof. D. V. Davies, Mr. R. J. Last. Physiology: Prof. D. T. Harris, Prof. Henry Barcroft. Midwifery: Mr. H. G. Kirwan-Taylor, Mr. Henry Evers, Dr. R. K. Bowes, Mr. D. M. Stern. Pathology: Mr. Lennox Broster, Dr. J. O. Oliver, Dr. H. A. Magnus, Prof. Ernest Finch.

Diploma in Public Health.—Preliminary: Dr. Ian McCracken. Final: Dr. C. O. S. B. Brooke.

Diploma in Tropical Medicine and Hygiene.—Colonel Sydney Smith, Colonel H. E. Shortt.

Diploma in Ophthalmology.—Mr. J. H. Doggart, Prof. Arnold Sorsby, Mr. R. C. Davenport, Mr. G. W. Black, Mr. A. B. Nutt, Mr. T. K. S. Lyle, Mr. A. G. Cross.

Diploma in Psychological Medicine.—Part I, Dr. Henry Wilson.

Diploma in Laryngology and Otology.—Part I, Mr. Geoffrey Bateman, Mr. F. C. Ormerod; Part II, Mr. J. H. Cobb.

Diploma in Medical Radiodiagnosis.—Part I, Mr. F. W. Spiers, PH.D.; Part II, Dr. Hugh Davies.

Diploma in Medical Radiotherapy.—Part I, Dr. Spiers; Part II, Mr. I. G. Williams.

Diploma in Anæsthetics.—Part I, Dr. E. S. Rowbotham, Dr. J. F. Taylor; Part II, Dr. W. A. Low, Dr. R. H. Boggon.

Diploma in Child Health.—Dr. A. D. C. Bell, Mr. George Macnab.

Diploma in Physical Medicine.—Part I, Dr. E. J. Crisp, Mr. Hubert Wood; Part II, Dr. Frank Cooksey, Mr. Philip Wiles.

Diploma in Industrial Medicine.—Part I, Dr. Arthur Massey; Part II, Dr. Hubert Wyers.

Dr. H. D. Ross was appointed as lecturer in pathology in the college.

Diplomas of fellowship were granted to the following candidates:

C. W. F. Burnett, W. H. H. J. de W. De Wytt, R. D. Ewing, G. W. V. Greig, J. M. M. Drew, P. H. Jayes, H. H. W. Jackson, B. D. Stutter, E. N. Owen, Mary Savory, J. R. Hudson, G. R. Fisk, H. M. Jamison, J. P. Jackson, W. H. W. Jayne, E. P. Kempsey, R. T. Hinde, P. A. L. Roberts, Maurice Hershman, H. P. Jones, Michael Bates, R. C. Bell, D. H. C. Harland, C. C. K. Smith, J. H. Peacock, P. H. Wood, P. B. Counsell, D. H. Teasdale, John Wilks, T. L. Schofield, T. O. Candler, J. H. L. Ferguson, T. G. Harvey, G. C. Lloyd-Roberts, H. O. Thomas, Herbert Davis, M. P. Pick, Harold Hassall, T. B. Smith, C. H. Barnett, N. G. McGuire, J. L. Wakelin, R. E. Connor, M. R. Williams, R. D. de Vere, D. H. Woodhead, C. H. de Boer, W. H. Lonsdale, F. W. Dixon, Woolf Herschell, W. G. Schulze, D. J. Waterston, T. D. Kelly, A. P. Sandrasagra, J. R. Frylinck, K. C. McKeown, A. Y. Mason, J. E. Buck, Puliyur Krishnaswami Duraiswami, F. B. Korkis, W. R. McKechnie, J. A. B. Thomas, J. D. Hallissy, Kenneth Harrison, J. R. Magarey, D. M. Morrissey, Cawasjee Jamshedjee Rustomjee, G. R. Yarwood, W. R. Carswell, B. M. Hay, F. I. Herbert, J. D. Sidey, S. C. F. Stephenson, F. R. Zadik, H. K. Bourns, H. L. Brunow, T. C. H. Davies, Kedar Nath Kashyap, A. I. Lichter, G. G. C. McKenzie, Navaratna Srinivasa Rao, E. A. Turner, A. G. A. Albers, Alan Glass, N. C. Newton, H. I. Rees, C. R. E. Stephens, Chakiri, Balakrishnan, S. de C. Barclay, G. G. Ferguson, J. B. Foster, N. A. Fowler, H. W. Gowland, D. MacK. Hamilton, L. A. Jacobs, E. L. H. Jones, Hameed Hussain Mirza, D. W. H. Ruddick, W. A. Wilson, Ghanim Yacoub Akrawi, William Burnett, O. O. Cowpe, I. D. Henderson, E. R. Lecutier, W. J. Melvin, A. F. Robinson, Frank Robinson, P. J. M. van Miert, D. J. Wurth, Dawood Yassa, I. F. Barwell-Clarke, N. K. Connolly, Marcus Fredman, I. J. C. Frew, N. S. Hooton, Satyaranjan Konar, J. M. Langham, D. M. McG. Portley, J. H. Saunders, Barbara F. Smith, M. R. Stanley, J. K. Watt, A. R. Anscombe, P. F. Boreham, Roger Brearley, J. E. Critchley, R. B. Lynn, Satyabrata Sen.

Diplomas of membership were granted to Eleanor H. Barrington, Thelma W. Dafforn, and S. N. Mathur.

The following diplomas were granted jointly with the Royal College of Physicians:

D.T.M. & H.—Y. G. Abdelal.

D.A.—D. C. Adamson, T. D. Ap Ivor, Agnes W. Baker, D. K. Ballingall, Donald Beaton, F. W. Chippindale, H. A. Condon, Margaret R. Connolly, Elizabeth S. N. Fenton, E. N. S. Fry, K. B. Glynn, J. J. Hargadon, C. B. Holland, C. D. T. James, R. D. Levis, O. I. Lewis, Sampson Lipton, W. G. G. Loyn, L. E. McDonnell, W. G. McEwen, B. H. McGuirk, E. S. Machell, H. G. Middleton, B. G. P. Oakenfull, N. P. Read, Moshi Ezra Samrah, R. G. Sykes, J. E. Tees, J. G. Warnock, H. Y. Wishart.

D.M.R.-D.—D. H. Bodger, Philip Cliff, J. F. Doherty, P. K. D. Edmunds, Aldo Giordani, Trevor Griffiths, Prabhat Kumar Haldar, D. I. Harries, B. B. Harrison, Hung-Chin Ho, G. T. Holroyd, G. A. MacDonald, J. P. MacLaughlin, H. F. March, T. L. C. Pratt, S. P. Robson, F. G. M. Ross, Joseph Rubin, Jean M. Sheach, J. A. Shiers, G. M. Sinclair, Dalip Shah Singh, C. C. Smith, R. S. Smith, P. H. D. Stone, Z. L. Szur, R. J. S. Walker, A. S. Whitehead, F. B. Wright.

D.M.R.-T.—I. G. D. Bell, W. H. Bond, I. F. J. Churchill-Davidson, Lionel Cohen, W. J. L. Francis, J. McD. Glennie, A. W. G. Goolden, G. F. Green, Simon Kramer, V. B. Levison, Santiago Londoño, Lilian J. Mallender, Marjorie S. Milln, R. F. Parfitt, J. J. Phelan, Yusuf Sidiq, H. C. Warrington.

Royal College of Physicians of Ireland

On June 3 the following were admitted to the fellowship:

Honor M. Purser, J. A. O'Sullivan, S. P. Dundon, B. G. Alton, Bryan Mayne.

The following were admitted to the membership:

W. L. Burrowes, M. B. Conlon,* C. P. Dempsey, Ranbir Singh Garewal, J. B. Lyons, Moses Adekoyejo Majekodunmi, B. E. Swain, J. M. Taylor, E. L. Wilson.

*In absentia.

Royal College of Obstetricians and Gynæcologists

At a meeting of the council on May 28, with Sir William Gilliatt, the president, in the chair, the following were elected to the council:

O'Donel Browne, Dublin, G. F. Gibberd, London, Hilda N. Lloyd, Birmingham, J. E. Stacey, Sheffield (as representatives of the fellows); Gavin Boyd, Belfast, L. B. Patrick (as representatives of the members).

The following were admitted to the fellowship:

Doris C. Bates, R. B. Charlton, K. M. K. Duff, M. D. A. Evans, J. D. S. Flew, Barton Gilbert, J. W. Johnstone, W. I. C. Morris, Margaret M. Nolan, C. K. Vartan, William Waddell, R. G. Worcester

The following were admitted to the membership:

G. McG. Barr, A. G. Barthels, D. W. Bentinck, Bimala Bhattacharya, D. K. Black, Kathleen M. Bower, Muriel Brighton, C. H. Brown, J. M. Buchanan, D. P. Cocks, H. J. A. Conte-Mendoza, Edward Cope, S. E. Craig, F. A. L. da Cunha, F. B. Davidson, Jyotsna Dei, Frank Denny, Nagala Subhadra Devi, C. J. Dewhurst, Kathleen A. D. Drury, J. G. Dumoulin, J. M. Duncan, Lamia Taha El-Badri, B. H. Ellis, H. R. England, I. B. Faris, B. J. Frankenberg, J. S. Fraser, W. K. Frewen, H. G. Furnell, L. W. Gall, G. B. Gibson, L. S. Glass, Cecilie Greig, G. T. H. Harris, E. I. Holloway, C. G. Irwin, W. H. Laird, R. G. Law, Silvia C. Lewin, Ethna W. Little, L. E. Lotimer, R. L. Lunt, J. G. McCarroll, H. A. McCredie, J. A. McGhie, J. F. McInerney, R. M. McIntosh, I. D. Macintyre, A. A. McKirdy, A. T. McNeil, D. S. Mathews, Gardiner Mitchell, J. E. E. Morgan, N. F. Morris, Naizby Noble, A. F. Pearson, H. E. Pellew, H. K. Porter, D. A. Ranasinghe, B. C. M. Reed, J. S. Reid, W. A. Robson, E. S. Rogers, J. K. Russell, Humara Sayeed, C. R. Sluming, D. F. Smith, R. B. C. Stevenson, Arcot Sundarama Subramani, Jack Suchet, B. M. Sutherland, Eleanor Tennant, Mary E. Tighe, Mary U. Wilkin, E. O. Williams, E. G. Zacks.

Lady Tata Trust

The trustees of this fund have made the following awards for research in blood diseases, with special reference to leukæmia, in the year beginning Oct. 1, 1949:

Grants for research expenses and assistance: Dr. M. C. Bessis (Paris), Dr. Jorgen Bichel (Aarhus, Denmark), Dr. Pierre Cazal (Montpellier), Dr. Johannes Clemmesen (Copenhagen), Dr. Endrev Kelemen (Szeged, Hungary), Dr. J. C. Mehta (Agra, India), Prof. Charles Oberling (Paris), Dr. Edith Paterson (Manchester), Dr. Günther Schallock (Münster), Prof. Edoardo Storti (Pavia).

Scholarships.—Dr. Pascou Atanasiu (Rumania) for work in Paris; Dr. C. F. M. Plum (Denmark) for work in Copenhagen.

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Association of Clinical Pathologists

On the occasion of the centenary of University College, Cork, a meeting of the association will be held in the department of pathology there, on Friday and Saturday, July 22 and 23.

Ligue Européenne contre le Rhumatisme

Dr. W. S. C. Copeman has been elected president of the league for the next two years. The next congress will be held in Barcelona in 1951.

Royal Appointments

Air Commodore Abraham Briscoe has been appointed honorary physician to the King in succession to Air Vice-Marshal Sir Alan Rook, and Air Commodore C. T. O'Neill in succession to Air Vice-Marshal Thomas McClurkin.

Westminster Medical School

The Earl of Athlone, chancellor of the University of London, will open the centenary celebrations of the school which are to be held at Church House, Great Smith Street, S.W.1, on Wednesday, July 13, at 3 P.M.

North of England Society of Anæsthetists

At a combined meeting of this society with the Newcastle Obstetrical and Gynæcological Society at 7.30 P.M. on Friday, July 1, in the Royal Victoria Infirmary, Newcastle-on-Tyne, Dr. Robert A. Hingson (Baltimore) will speak on Analgesia for Obstetrics.

World Health Organisation

The second World Health Assembly of the organisation which opened in Rome on June 13, will continue till July 3. The principal items on the agenda are the programme and budget estimates for 1950, which lay down the long-range plans of the organisation.

Exhibition of Medical Photography

On Monday, July 4, at 6.30 P.M., Sir Cecil Wakeley will open an exhibition of medical photography which the medical group of the Royal Photographic Society are holding at 16, Princes Gate, London, S.W.7. The exhibition will be open daily from 10 A.M. to 5 P.M. until July 16, and admission is free.

Care of Laboratory Animals

A discussion on this subject will be held at noon on Tuesday, June 28, at the Grand Hotel, Harrogate. Prof. R. J. V. Pulvertaft, the president of the section of pathology and bacteriology of the British Medical Association, will take the chair. Prof. A. N. Worden, M.R.C.V.S., and Dr. Jean Vinter will speak on behalf of the Universities Federation for Animal Welfare.

Birmingham and Midland Obstetrical and Gynæcological Society

On March 31 at a meeting of the Midland Obstetrical and Gynæcological Society it was unanimously decided to wind up this society and to found a new one to be called the Birmingham and Midland Obstetrical and Gynæcological Society. The following office-bearers were elected: president, Prof. Hilda Lloyd; secretary, Mr. H. C. McLaren; treasurer, Mr. Samuel Davidson.

Diets for Invalids

On the advice of the Food Rationing (Special Diets) Advisory Committee the Minister of Food has made the following changes in the special diets allowed to certain invalids:

Hepatitis, acute infective hepatitis (catarrhal jaundice), toxic jaundice.—Meat: A maximum allowance of 4 rations per week (instead of 3).

Hepatitis chronic (cirrhosis of the liver).—Meat: A maximum allowance of 4 rations per week (instead of 3).

Hypoproteinæmia.—Meat: A maximum allowance of 5 rations per week (instead of 4).

Nephritis, with gross œdema and gross albuminuria (nephrosis).—Meat: A maximum allowance of 5 rations per week (instead of 4).

Steatorrhœa (including cœliac disease and tropical sprue).—Meat: A maximum allowance of 6 rations per week (instead of 5). Butter/margarine/cooking fats: The butter ration will now be retained and only the margarine and cooking fats coupons will be cancelled. Formerly, all the fats coupons were cancelled.

Steatorrhœa, convalescent.—Meat: A maximum allowance of 3 rations per week instead of 2. Liquid milk: A priority allowance of 7 pints per week.

No change has been made in the allowances for diabetes mellitus and for spontaneous hypoglycæmia.

Training of Nurse Tutors

The arrangement by which Government scholarships have been granted to selected nurses intending to train as nurse tutors is to be brought to an end. In its place, nurses, male or female, who are accepted by recognised training institutions are to be granted leave on full pay, including emoluments; the nurse will be required to pay the full cost of the training.

Institute of Child Health

Prof. Gordon Murray, senior surgeon to the Toronto General Hospital, will deliver the Alex Simpson-Smith lecture for 1949 on Monday, July 11, at 5 P.M., at the Hospital for Sick Children, Great Ormond Street, London, W.C.1. He is to speak on the Artificial Kidney. Tickets may be had from the dean of the institute at the hospital.

British Cardiac Society

The 13th annual meeting of this society was held at Newcastle, co. Down, on June 2, under the chairmanship of Dr. S. Boyd Campbell. A debate on rheumatic heart disease, with special reference to the pathology of rheumatic carditis and the rheumatic heart in pregnancy, was followed by short communications as arranged by Dr. K. Shirley Smith, the hon. secretary.

The Collected Papers of the Middlesex Hospital medical school for the years 1946–48 have now been issued.

CORRIGENDUM: *Fatal Human Case of Canicola Fever.*—Prof. J. W. Wolff, of Amsterdam, informs us that in the Dutch case referred to by Dr. R. S. Weetch and others (May 28, p. 906) the necropsy was performed by Dr. R. van Dam.

Diary of the Week

JUNE 19 TO 25

Tuesday, 21st

INSTITUTE OF DERMATOLOGY, 5, Lisle Street, W.C.2
5 P.M. Mr. A. K. Monro: Varicose Eczema, Ulceration, &c.

CHADWICK LECTURE
2.30 P.M. (26, Portland Place, W.1.) Dr. Sibyl Horner: Evolution of Industrial Work for Women and Young Persons and its Effect on the National Health.

EDINBURGH POST-GRADUATE BOARD FOR MEDICINE
5 P.M. (University New Buildings, Teviot Place.) Dr. E. R. Boland: Pneumoconiosis.

Thursday, 23rd

ST. GEORGE'S HOSPITAL MEDICAL SCHOOL, S.W.1
4.30 P.M. Dr. Desmond Curran: Psychiatry lecture-demonstration.

MEDICO-LEGAL SOCIETY
8 P.M. (26, Portland Place, W.1.) Mrs. Florence Earengey, J.P.: Legal and Economic Status of Women.

NORTH-EAST METROPOLITAN REGIONAL TUBERCULOSIS SOCIETY
2.30 P.M. (Harts Sanatorium, Woodford Green, Essex.) Dr. Philip Ellman: Assessment of Collapse Therapy in Pulmonary Tuberculosis.

Friday, 24th

WESTMINSTER HOSPITAL SCHOOL OF MEDICINE, Horseferry Road, S.W.1
5.30 P.M. (Meyerstein theatre.) Dr. J. G. Humble, Dr. R. H. Trinick: Hæmolytic Anæmia.

Appointments

DESHMUKH, G. N., M.B. Bombay, D.A.: A.M.O. (class 1), anæsthetics department, Archway Group of Hospitals, London, N.19.*

THOMAS, H. ORISHEJOLOMI, M.B. Birm., F.R.C.S.: lecturer, department of surgery, University College, Ibadan, Nigeria.

North East Metropolitan Regional Hospital Board:

STEWART, E. F., F.R.C.S.: E.N.T. surgeon (part-time), Metropolitan Hospital.

SAVAGE, C. S., M.A. Camb., F.R.C.S.: E.N.T. surgeon (part-time), Chelmsford and Essex, St. John's, and W. J. Courtauld Hospitals.

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SOCIAL FACTORS IN OBSTETRICS*

DUGALD BAIRD
M.D., B.Sc. Glasg., F.R.C.O.G., D.P.H.
REGIUS PROFESSOR OF MIDWIFERY, UNIVERSITY OF ABERDEEN

REPRODUCTION is fundamentally influenced by heredity but is also greatly affected by custom, tradition, standards of education, and economic factors. The influence of heredity is difficult to study in man, and is not discussed in this paper, which deals only with the social factors affecting reproductive performance.

It is important to consider the patient in relation to her home. This is often forgotten in these days when so much investigation and treatment is carried out in hospital, where the patient is in abnormal surroundings and may react very differently from when she is at home. The hospital doctor may know nothing about the home circumstances and is apt to think of the patient as a case for diagnosis and treatment regardless of the social and psychological background. This is nowhere more true than in obstetrics, especially now that more than half the confinements take place in hospital and, not unnaturally, attention has been focused more on the many striking advances in technique than on the patient herself and her home environment.

DEFINITION OF GOOD REPRODUCTIVE PERFORMANCE

We must begin by defining the standard of reproductive performance which is our aim, and see, if possible, how far various social factors influence it.

We may postulate that the highest grade of efficiency means high fertility, very good health, and a sense of well-being during pregnancy, freedom from any of the recognised complications, spontaneous delivery of a live and vigorous child, normal involution, and successful lactation. How far short of this standard any particular person may fall, and why, is very difficult to determine accurately. For example, how much significance is to be attached to vomiting during pregnancy, and how far is the length of labour an index of efficiency during labour? In view of these difficulties, it is understandable that in the past reliance has been placed largely on mortality figures, and up to a point this is justifiable. Thus it is now well recognised that mortality in the first twelve months of life is a most delicate index of living conditions, but in dealing with reproductive performance mortality is less helpful and sometimes even misleading.

DEATH-RATES AS AN INDEX OF REPRODUCTIVE EFFICIENCY

The study of death-rates has the great advantage that much statistical material on a national and international scale is available for analysis. In Britain the Registrar-General's five social classes, based on the husband's occupation, graded roughly according to incomes as they were fifteen years ago, provide a convenient starting-point for analysis. Certain difficulties appear, however. Changes are occurring in the social structure of Britain which have narrowed and altered the economic relationships of various social groups—for example, the incomes of the "white-collared" and "working" classes now overlap to a much greater extent than they did before the war, and yet the social background, traditions, and standards of education still differ considerably. Nevertheless, a comparison of the death-rates in the various social classes is useful.

Maternal Mortality

In 1930–32 in England and Wales the maternal mortality in classes I and II (professional and upper classes) was 4·44 per 1000 births, an excess of 14·1% over that of class V (unskilled workers, unemployed, &c.), which was 3·8 per 1000 births. This does not prove that the individual women in social class V have a better reproductive performance than those of the same age and parity in social class I. The difference might be explained by the fact that in social classes I and II the average age of the mother at the time of the birth of the first child is higher and the total number of children per family much smaller. This would mean that there is a high proportion of elderly primiparæ in classes I and II, and, as is well known, maternal mortality is high in such cases. We therefore require an analysis of maternal mortality by age, parity, and social class.

Dr. Percy Stocks, of the Registrar-General's office, has made an analysis (unpublished) of those maternal deaths in 1939 where the age, parity, and social class are known; and, though not all deaths are included because of lack of data, the findings are probably significant. He shows that 60% of the deaths in classes I and II took place in a first pregnancy and 6% in women who already had had four children, whereas in social class V 36% took place in a first pregnancy and 32% in women who had already had four children. As already stated, there are great differences in age and parity distribution between the social classes; hence we need a comparison of the mortality-rates in each five-year age-group and each parity, and a further analysis of the causes of death within each of these subgroups.

Since maternal mortality is now very low, and since the numbers in social classes I and II are so small, national figures for England and Wales for at least a five-year period would be necessary before a satisfactory detailed analysis could be made.

Maternal mortality cannot therefore be used as a means of assessing reproductive performance.

Fœtal Mortality

Fœtal deaths (stillbirths and neonatal deaths) are influenced by much the same factors as those affecting maternal mortality; and, since fœtal deaths are about twenty times as common as maternal deaths, conclusions can be drawn from smaller numbers. In 1939 in England and Wales the stillbirth-rates in social classes I and V were 24·4 and 39·7 per 1000 births, and the neonatal mortality 18·9 and 30·1 per 1000 births respectively. I have suggested[1] that these crude figures underestimate the harmful effect of poor social conditions owing to the age and parity factors previously mentioned. The fœtal mortality in social class V is two or three times that in social classes I and II. Statistical analysis of stillbirths by social class shows that social classes I and II have a lower, and classes IV and V have a higher, death-rate than one would expect from their age-composition. This is explained by the fact that primiparæ in social classes I and II maintain their good standard of reproductive performance as judged by stillbirth-rates till the age of 30, whereas in classes IV and V the standard declines ten years earlier, from the age of 20.

Having established by comparison of fœtal mortality that social classes I and II are more efficient than the others, we must now try to discover the reasons for this. In what respects do the women in these two groups differ? The most obvious difference, even to the casual observer, which is not affected by clothes and other fashions is the difference in height.

Fig. 1 is an analysis of three groups of primigravidæ studied in 1944–47 in Aberdeen: N, 876 consecutive primigravidæ in a nursing-home; NI, a group of 450 confined in a nursing-home where the fees were much lower than in N; and H, the first 876 of 3600 booked primigravidæ in the Aberdeen Maternity Hospital. The figure shows that the percentage of the total under

* A lecture given at the Westminster Hospital Medical School on Nov. 26, 1948.

1. Baird, D. *Lancet*, 1947, ii, 531.

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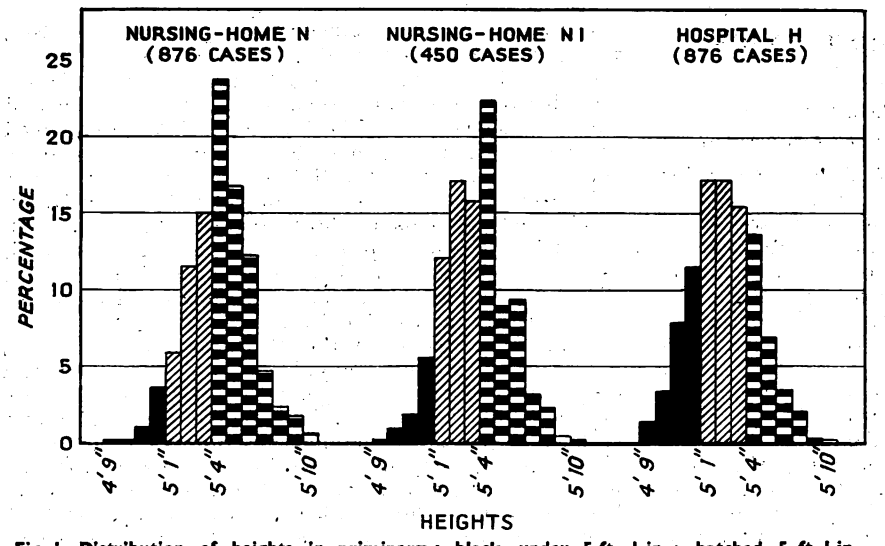

Fig. 1—Distribution of heights in primiparæ: black, under 5 ft. 1 in.; hatched, 5 ft. 1 in.–5 ft. 3 in.; checked, over 5 ft. 3 in.

5 ft. 1 in. in height rose steadily from 5% in group N to 26% in group H, and conversely the proportion of women 5 ft. 4 in. or more in height fell from 63% in group N to 23·5% in group H.

Figs. 2 and 3 show respectively group N and the 876 cases in group H analysed by height and age; and we see that in group H (fig. 3) the biggest individual group comprised women aged 20–24 years under 5 ft. 1 in. tall, and in group N (fig. 2) women aged 25 to 29 years 5 ft. 5 in. tall or over. The women in group N were therefore older and taller than those in group H. In group N there were only 4 (0·5%) under 20 years of age, and only 44 (5%) under 5 ft. 1 in. in height. In group H 415 (11·5%) were under 20 years of age, and 26% were under 5 ft. 1 in. tall.

In general, the women in group N looked healthier, as judged by vitality, texture of skin, and condition of gums and teeth, and were also very much better groomed. When group H was analysed in detail, the tall women were found, on the whole, to be healthier than the small women.

These two facts—that small women (under 5 ft. 1 in. tall) were found more commonly in the hospital group, and that the small women in the hospital group were not so healthy as the tall women in the same group—suggest that many of the small women are small not so much because of heredity but because they have been stunted by poor feeding during the growing years.

Fig. 4 illustrates the distribution of fœtal mortality in the 3600 primiparæ in the hospital group (H) arranged by age and height. Each whole square represents a mortality of 10 per 1000 births. The fœtal mortality-rates for women of all ages under 5 ft. 1 in. and over 5 ft. 4 in. in height were 50 and 26 respectively, and the figure shows that highest mortality-rates were found where the mother was over 30 years of age and under 5 ft. 1 in. in height. This excess in the small women is not explained by the greater incidence of difficult labour in the small women. The proportion of the total fœtal deaths attributed to cerebral birth trauma was 12% in the small women and 16% in the tall. The difference in total mortality is explained by excess deaths from fœtal deformity, asphyxia, pre-eclampsia, prematurity, and infection in the babies of the small women.

CÆSAREAN-SECTION RATE AS A MEASURE OF REPRODUCTIVE PERFORMANCE

Inability to deliver the child by the vagina may also be taken as an index of poor reproductive performance. Fig. 5 shows the distribution and frequency of cæsarean section for all causes in group H analysed by age and height. It shows that the cæsarean-section rate was nearly four times as great in women under 5 ft. 1 in. in height as in those 5 ft. 4 in. or more. The rate increased with age and decreased as height rose. The distribution was the same as that of fœtal deaths (fig. 4).

Assessed, therefore, by the cæsarean-section rate and fœtal mortality, reproductive performance was highest in tall young women. Figs. 2 and 3 show that the hospital group contained too many small women, and the nursing-home group too many women over the age of 30, for either group to have a good reproductive performance.

The accompanying table shows that the cæsarean-section rate in hospital group H was 1·3% and in nursing-home group N 2·1%. This higher cæsarean-section rate in group N was due to the greater age of the patients In women under 25 years of age, however, there were no cæsarean sections at all in group N, whereas in group H the rate was 0·4%. This difference is due to the fact that many of the young women in group H were small, and

CÆSAREAN-SECTION RATES

	Hospital group			Nursing-home (N) group		
	Under 25 yr.	Over 25 yr.	Total	Under 25 yr.	Over 25 yr.	Total
No. of women	2108	1492	3600	183	693	876
No. of cæsarean sections	9 (0·4%)	39 (2·6%)	48 (1·3%)	0	19 (2·7%)	19 (2·1%)

that, despite youth, cæsarean section is necessary because of contracted pelvis if they are small. (Of those under 5 ft. 1 in. in height and under 25 years of age in group H 0·4% required cæsarean section for contracted pelvis.) No cæsarean sections were necessary in any of the 8 women in group N who were under 5 ft. 1 in. in height and under 25 years of age. Any group of primiparæ, tall and young, will require very few cæsarean sections for any reason at all.

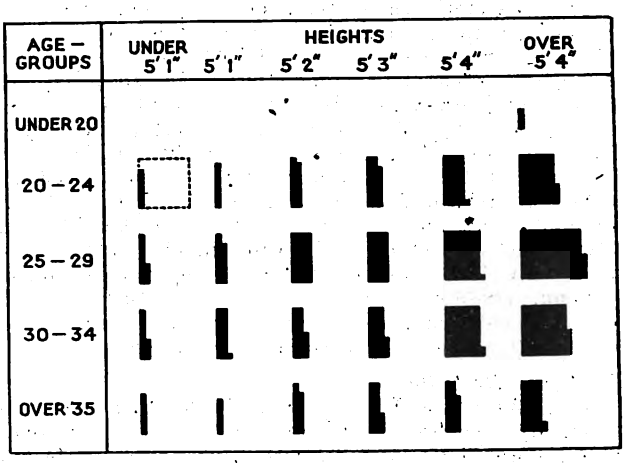

Fig. 2—Age-distribution of heights in primiparæ in nursing-home N. Area enclosed by interrupted line represents 400 persons.

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The high incidence of cæsarean section in group N due to the high average age of the group, if typical of this income group throughout the country, will be accompanied by a rise in the maternal mortality in social classes I and II. Improved technique in recent years has made cæsarean section safer, but this can act in two ways. It will lower the operative mortality and to that extent lower maternal mortality, but it will also lead to more cæsarean sections. So long as cæsarean section is carried out in cases where the alternative is a difficult vaginal delivery no harm will result; but, if it means more elective cæsarean sections in cases where normal labour would possibly have resulted, the number of maternal deaths may well rise, since any abdominal operation carries a risk. The fact that cæsarean section is now practically free from the risk of serious sepsis, even after many hours of labour, should allow of an extended trial labour and lead to the elimination of unnecessary cæsarean sections. Anxiety to secure a live birth has led to an increased use of elective cæsarean section. This is seldom justifiable in a primigravida, since it is difficult to predict in any particular case whether labour will be easy or difficult, and cæsarean section might well be done in a case where labour would have been easy and imposed little or no strain on the child.

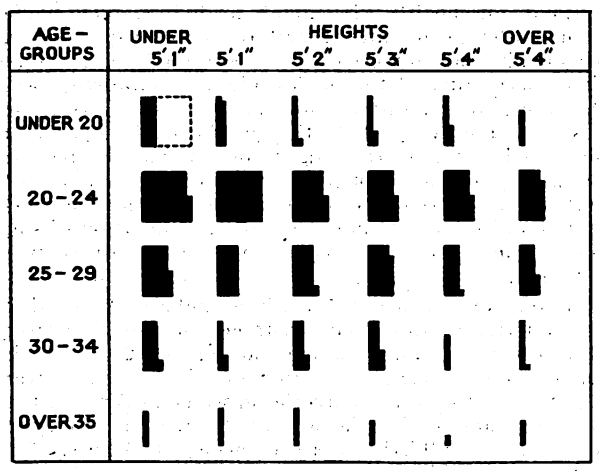

Fig. 3—Age-distribution of heights in primiparæ in hospital. Area enclosed by interrupted line represents 400 persons.

Why should cæsarean section be necessary at all? In fig. 6 the cases in group H are analysed by age and height. This figure shows that in women under the age of 20 years cæsarean section was only required in those under 5 ft. 1 in. in height. The same applies to the age-group 20–24, with one exception where cæsarean section was done in a patient 5 ft. 1½ in. tall. From the age of 25 onwards the cæsarean-section rate increased in women of all heights. When, however, contracted pelvis as an indication for cæsarean section is studied separately it is clear (fig. 7) that in the hospital group, no matter what the age of the patient, cæsarean section for contracted pelvis was only necessary in women under 5 ft. 1 in. in height. The numbers in group N were too small to allow of a graph being prepared similar to that for group H, but the following are the figures of all age-groups combined:

Height	*No. of cæsarean sections because of contracted pelvis*
Under 5 ft. 1 in.	5 out of 44 cases (*11·3%*)
5 ft. 1 in.–5 ft. 2 in.	2 out of 54 cases (*3·7%*)
Over 5 ft. 2 in.	0 out of 778 cases

Thus, in the nursing-home group N also, cæsarean section because of contracted pelvis was only necessary in small women.

Fig. 8 shows why increasing age in primigravidæ in group H increased the incidence of cæsarean section.

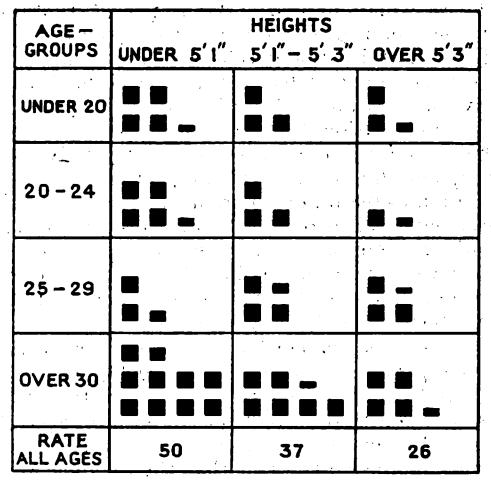

Fig. 4—Fœtal mortality-rate in 3600 primiparæ in hospital according to age and height.

It shows that until the age of 25 contracted pelvis is the only factor of importance, but in the older age-groups other factors play a more important rôle. Over the age of 30 uterine dysfunction is the most important single factor, and fœtal distress, pre-eclampsia, and relative infertility are also important. Fig. 9 shows that in the nursing-home group N there were no cæsarean sections for any cause till after the age of 25. After this age uterine dysfunction is most often the indication. Fœtal distress and pre-eclampsia are less often indications in this group. Since practically all the women in the nursing-home group N who required cæsarean section were transferred to hospital for operation, it was possible to study the indications carefully. The diminished frequency of pre-eclampsia as a factor influencing the performance of cæsarean section is further evidence of a lower incidence of pre-eclampsia in private than in hospital practice. The absence of fœtal distress as a factor may also be confirmatory evidence of what has been deduced from a study of fœtal mortality—that the babies in the nursing-home group are on the whole much more vigorous and robust than those in the hospital group. There may, of course, be a tendency, in the nursing-home group, to do cæsarean section earlier in a trial labour before the fœtus is distressed.

There is no reason why a woman who has been brought up in a good environment and on a good diet but is

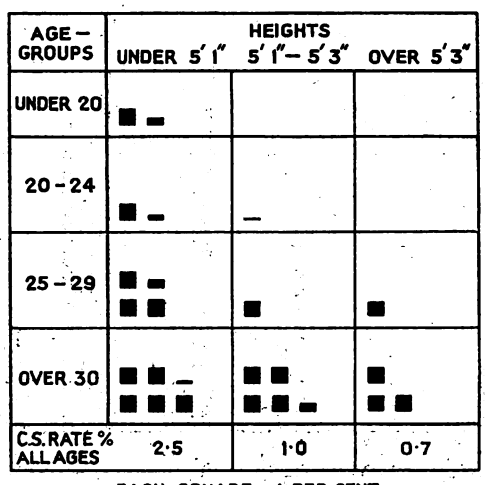

Fig. 5—Cæsarean-section rate in primiparæ in hospital according to age and height.

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nevertheless small should have a poorer reproductive performance than a tall woman. Our experience in this investigation, at least, suggests that most small women are not small genetically but are stunted because of poor environment and feeding in their early years. This receives confirmation from the work of Bernard (unpublished) who has done accurate X-ray pelvimetry in two groups of 100 primigravidæ, one small and the other tall. He found 0·8 in. of difference in the true conjugate measurement, and in over 20% of the small women the true conjugate measurement was less than 4 in. These pelves showed typical flattening of the posterior segment of the brim. None of the tall women showed flattening of the posterior segment of the pelvis.

It has been shown earlier that cæsarean section for contracted pelvis was necessary in 0·4% of the small women (under 5 ft. 1 in. tall) in group H. A higher cæsarean-section rate might have been expected, but the relatively low rate in view of the pelvic measurements may be due to the fact that the average weight of full-time babies is $^3/_4$ lb. lighter in women under 5 ft. 1 in. than in women of 5 ft. 4 in. or over. Premature labour is also more common among small women. The size of the baby is influenced mostly by the size of the mother. It may also be influenced by the mother's health and diet during pregnancy, but there is no clear evidence on this point. Within limits the weight of the baby at birth is probably not of prime importance. What matters more is that the baby should be strong and healthy and able to withstand the hazards of birth. It has been shown above that the fœtal mortality in the small women was much higher than the average. In many the clinical features were compatible with the theory that the primary cause of the death was weakness and lack of vitality of the fœtus. This raises an important practical point for the obstetrician: is it wise to induce premature labour in these small women with contracted pelvis? Disproportion may be avoided, but the baby is then not only lacking in vitality but also premature, and

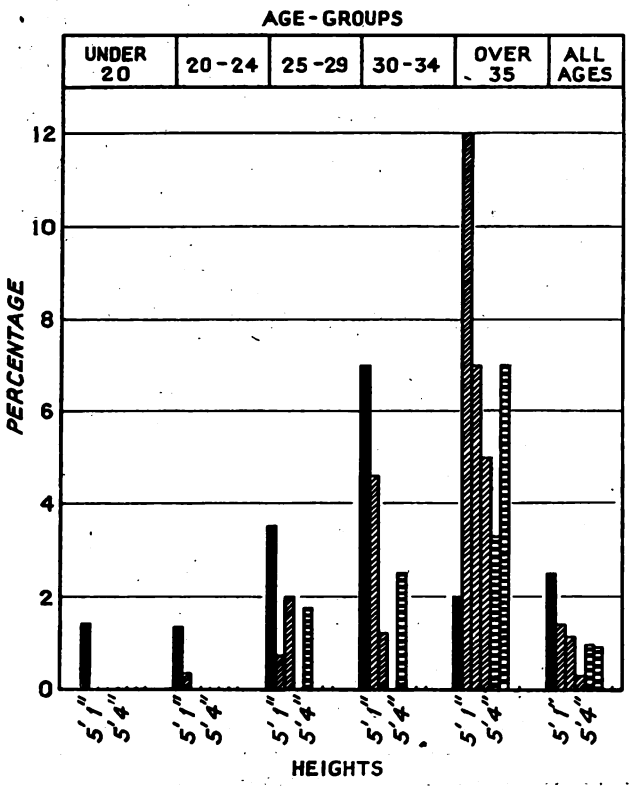

Fig. 6—Same as fig. 5 but shown differently for comparison with fig. 7.

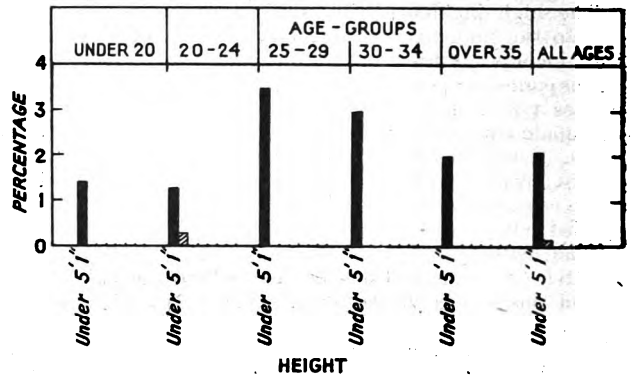

Fig. 7—Distribution of cæsarean section due to contracted pelvis according to age and height in primiparæ in nursing-homes.

in consequence the risk of fœtal death during or soon after labour may be greatly increased.

It would be interesting to see what effect could be produced by feeding a group of small women from social classes IV and V on an optimal diet during pregnancy and at the same time securing for them living conditions optimal for health. It might lead to larger babies with harder heads and therefore more disproportion. This might lead to more cæsarean sections. At the same time the vitality of the babies might be improved, with the result that the fœtal mortality would be less. It is possible, however, that the mothers, being undernourished from birth, might be unable to respond completely to the improved living conditions and diet, with the result that the reproductive performance would still be defective. It might require a generation of such good living conditions before the best results were obtained.

In our experience, so far, the highest standard of reproductive performance is attained in the small group of tall young women (under the age of 25) in social classes I and II—e.g., in group N of this series there were 171 (24% of the total) deliveries in women over 5 ft. 1 in. in height and under the age of 25, with no cæsarean sections, 1 stillbirth, and no neonatal deaths. The lowest standard is shown in small women (under 5 ft. 1 in. tall) over the age of 30 in social classes IV and V—e.g., in group H of this series there were 378 in this category (10·5% of the total), and of these deliveries 16 were by cæsarean section (4·2%) and there were 15 stillbirths and 6 neonatal deaths (fœtal mortality 55 per 1000).

The logical sequel is to investigate why these striking differences exist. This means a detailed study of individual cases, which is possible only in small groups. Therefore fœtal deaths are no longer of the same value as indices since they require large groups. Some other indices of reproductive performance are needed and this immediately raises the difficult problem of what constitutes good reproductive performance, and how it can be measured. I have already defined good reproductive performance in general terms, but a little more detail is now indicated. It will mean the absence of hyperemesis, pyelitis, pre-eclampsia, or antepartum hæmorrhage; a spontaneous delivery in less than twenty-four hours; a strong vigorous child which cries lustily, exhibits strong movements, and sucks strongly when put to the breast; and a mother who will have no difficulty in supplying sufficient milk to enable the baby to gain weight steadily.

When we analyse the problem more closely, however, we find it difficult to assess tiredness, lack of appetite, heartburn, low weight gain, varicose veins, and constipation as measures of poor reproductive performance. The ideal patient should have none of these symptoms and

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should have a feeling of well-being and a good appetite and should gain weight steadily. During labour, causes of delay are difficult to detect accurately, and their significance as an index of poor performance during labour is difficult to assess.

How does one tell whether a particular baby is more vital than another? Some measure is necessary if we are to correlate vitality with the mother's health and diet during pregnancy. Some idea may be obtained by noting the presence or absence of fœtal distress during labour, and the child's behaviour after birth. The vigour of its movements is difficult to measure, and its ability to suck depends on the type of breast and nipple, the milk-supply, and the efficiency of the mother and nurse.

It is therefore obvious that, though it is easy to postulate what we mean by good reproductive performance, it is very difficult to say how far the individual falls short of this ideal.

It may be possible by means of an ad-hoc investigation to gather much information on these points, but the routine records in the average clinic are not complete enough to make possible any general inquiry along these lines.

A high standard of recording is impossible without a large medical staff, but much could be done by improved

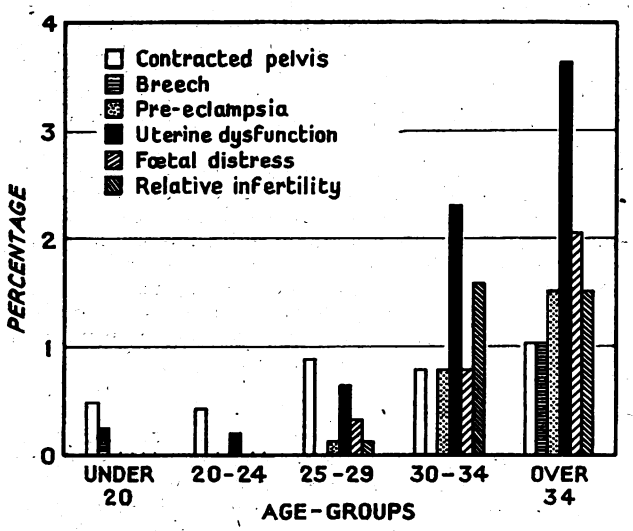

Fig. 8—Age-distribution of cæsarean section according to cause in primiparæ in hospital. (Less frequent indications for cæsarean section, such as placenta prævia, have been omitted.)

design of record forms in antenatal clinics and maternity hospitals.

SOCIAL FACTORS INFLUENCING REPRODUCTIVE PERFORMANCE

Efficient child-bearing will be influenced by many factors, but none so much as the mother herself. The mother is the product of heredity and environment, and therefore so far as possible the whole woman should be studied. We wish to know something of her basic intelligence, her personality, and her home background. We wish to know about her standard of education, her occupation and that of her husband, and all that goes to make up her living conditions. We wish to know how she spends her money and what kind of housewife she is, what kind of food she eats, and what she thinks about childbirth and the rearing of children. We can then study how she behaves during pregnancy, labour, and lactation, not only in a first pregnancy but also in subsequent ones. In this way we may be able to build up a picture of various types and discover what psycho-

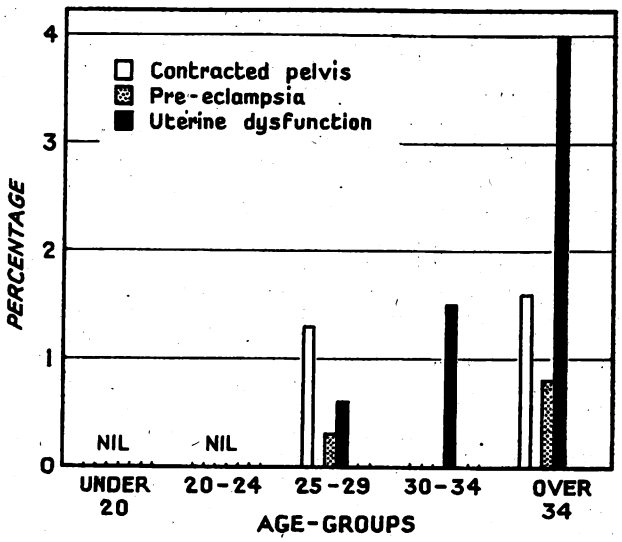

Fig. 9—Age-distribution of cæsarean section according to cause in nursing-homes.

logical, social, and physical influences affect reproductive performance and how they act.

Social-medicine research in child-bearing offers some peculiar advantages. The fact of pregnancy offers a ready introduction to the patient, and usually ensures coöperation, especially when it is obvious to the patient that definite advantages accrue from coöperation. Also, the effect of the various social factors can be assessed against a definite yardstick—reproductive performance.

Parturition and the first few days thereafter are the most dangerous phases of the baby's life, and the stronger and more vigorous the child the better chance it has of surviving the hazards of this critical period. We should save many lives if the factors influencing the vitality of the newborn were more clearly understood.

SUMMARY

Reproductive performance in primiparæ as assessed by a low fœtal mortality is much better in private practice (social classes I and II) than in hospital practice (social classes III, IV, and V).

Assessed by cæsarean-section rates performance is better in hospital than in private practice.

The best reproductive performance assessed by both methods is attained by young women (under the age of 25) in private practice who are 5 ft. 4 in. or more in height.

Intensive study of small groups in different social classes is required, to investigate the correlation of reproductive performance with such factors as intelligence, personality, housing, nutrition, family income, and standards of obstetric care.

A more delicate measure of reproductive performance than fœtal death-rates or cæsarean-section rates is needed.

". . . Ce n'est pas la médecine sociale qui a détrôné le médecin de famille au profit du spécialiste. Ce n'est pas elle qui, en rendant le diagnostic et le traitement à la fois plus efficaces et plus onéreux, complique le problème du coût des soins médicaux. . . . Ce n'est pas elle qui a transformé les conditions d'existence par l'industrialisation, l'urbanisation, la prolétarisation, et qui a entraîné la crise des classes moyennes. Elle demande simplement au médecin de comprendre et d'accomplir son devoir social."—Docteur RENÉ SAND. *Vers la médecine sociale.* Paris, 1948, p. 583.

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SOME THERAPEUTIC AND NEUROLOGICAL ASPECTS OF PERIPHERAL NERVE INJURIES

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THE purpose of this paper is to draw attention to certain therapeutic and neurological aspects of nerve injuries which we feel are not emphasised sufficiently, and about some of which our conclusions differ slightly from those of others. It is based on experience in treating over 400 nerve injuries in prisoner-of-war hospitals in Germany during 1940–45; detailed observations cannot be given because the notes were lost in Germany. The therapeutic section consists of remarks about physiotherapy, bulb suture, and the results of late operations. The neurological aspects discussed are the clinical testing of sensation, the relative vulnerability of motor and sensory fibres, and the inequality of recovery in different groups of muscles. Our experience was unusual, and perhaps unique, in that unselected groups of untreated patients were observed over long periods—clinical material that could hardly be found in other circumstances. In addition, we had, at different times, other patients on whom it was possible to operate under reasonable conditions.

PHYSIOTHERAPY

Stiff Joints

The prevention of joint stiffness is the first essential in the management of nerve injuries. Frequent full-range passive movement is more important than other forms of physiotherapy, such as splintage, massage, and electrical treatment, and in our experience neglect of this simple preventive did as much harm as lack of operation facilities. Proper medical supervision of wounded prisoners was rarely possible after the B.E.F. campaign, and later it was sad to see good spontaneous muscular recovery made ineffective through permanent stiffness of the digits. The chief faults were: (1) splintage that had been badly applied or used unnecessarily, especially in trying to prevent stretching of intrinsic muscles, and (2) omission to impress on the patient that his own frequent manipulation of the digits to keep them mobile was more effective in preventing stiffness than were occasional supervised treatments.

Stretching of Muscles

We believe that the stretching of muscles does not, to any serious extent, prevent recovery, and that the importance of avoiding it has been exaggerated. Unsplinted paralysed muscles are rarely, if ever, overstretched beyond the normal limit of relaxation; and it is unlikely that such an extensible tissue, even though paralysed, suffers greatly as a result of stretching within the normal range, at least not sufficiently to prevent good recovery if the muscle is correctly reinnervated. After axonotmesis a paralytic attitude—e.g., ulnar claw hand—gradually disappears in 6–12 months as power returns during full recovery without splintage or physiotherapy, apart from the patient's common sense in "playing" with the fingers to keep them mobile. We have even seen good recovery in muscles stretched continuously for 2 or 3 months in two patients, with complete radial-nerve paralysis and fractured humerus, who were treated by strapping the forearm and hand to the chest.

In the special circumstances of our experience it seemed that, when splints were not used, the reduced risk of joint stiffness more than compensated for any harmful effect of stretching the muscles. We do not, however, advocate the abolition of splintage, because it is required to prevent shortening of the unrestrained normal muscles, and this we regard as the main reason for its use. Experience led to the conclusion that stretching of muscles will not prevent recovery if they are correctly reinnervated and that poor recovery is due to axonal confusion rather than to structural changes in stretched muscles.

Massage and Electrical Treatment

Some patients had massage and a little faradism, but none had galvanism. Many with total paralysis due to axonotmesis recovered completely without treatment. After severe lesions or suture faradism undoubtedly improves the strength of proximal muscles during recovery, presumably from hypertrophy similar to that during athletic training, but it has no definite effect on distal muscles; nor would that be expected, for they are concerned not with strength of movement but with precision, which depends on correct reinnervation. Faradism supplies the stimulus of exercise and accelerates the return of the greatest attainable muscular power, whether complete or partial, but it cannot be expected to improve the quality of eventual recovery, for that is determined by the correctness of axonal reinnervation. Similarly, galvanism, which has been shown to delay and diminish muscle atrophy (Gutmann and Guttman 1942), can hardly improve partial recovery due to axonal confusion; its effect in delaying muscle degeneration and fibrosis is probably relatively unimportant after reasonably early operations, because wasted untreated muscles recover completely after high axonotmesis.

Distance of regeneration, lack of physiotherapy, and even a reasonable delay in operating are much less detrimental than incorrect reinnervation, and, in our opinion, they are not the main factors, as is sometimes implied, responsible for the poor recovery of distal muscles after high severe lesions or sutures. It has never been shown that electrical treatment improves the eventual recovery after severe lesions or suture, and it is unnecessary after axonotmesis.

BULB SUTURE

Bulb suture, or the two-stage operation, is valuable when the gap is too wide to allow end-to-end suture without tension, and it should be used more often than it appears to be. It was always done if there was any doubt about getting the ends together *easily* in one stage with only partial flexion of the appropriate joints. The resection and end-to-end suture were performed at least 3 months, and sometimes much longer, after bulb suture; 6–8 weeks was allowed after the first stage for immobilisation and subsequent gradual straightening of the limb. A one-stage suture that is just possible technically, leaving a tight nerve with full positioning of joints, is unphysiological and will probably be a failure. Moreover, to save length, fibrosed nerve, which greatly hinders regeneration, is apt to be left behind when the end bulbs are removed. If suture is worth doing in such cases, the nerve should be mobilised and elongated more gradually than is possible with a one-stage operation. Many operation failures are due to the ends tearing apart, and this may happen very easily—e.g., after upper-arm sutures, from sagging of the shoulder, which is difficult to prevent by bandaging. Tension also produces an intraneural traction injury (Highet and Sanders 1943). Nerve grafts were not used.

Our best results were, on the whole, obtained after bulb suture, especially with upper-arm and peroneal nerve injuries. For example, a patient with complete high ulnar and median division treated by bulb suture 26 months after wounding, followed by resection and

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suture 4 months later, showed after 3 years moderate action in all the wrist flexors, slight action in all long digital flexors, a flicker in the intrinsic muscles, and slight appreciation of touch, pain, and temperature everywhere. In another patient a peroneal nerve divided at the head of the fibula was joined by bulb suture 15 months after wounding, but the final suture could not be done for another 24 months. Even so, examination 3 years later showed considerable action in the tibialis anticus, which was independently assessed as 4; less in the extensor digitorum longus, estimated as $3^1/_2$; but no action in extensor hallucis or peronei—a good example of appreciable recovery in muscles after total paralysis for $3^1/_2$ years.

Bulb suture facilitates the removal of sufficient nerve for obtaining healthy ends, which is so very important and is so easily neglected at operation, and there is less risk of the suture line separating or of damage to the nerve from stretching. These advantages seem to be more important than the delay of a few months. Every effort should always be made at the original débridement to approximate, however roughly, divided nerve ends, because the prevention of 2 or 3 in. of retraction greatly simplifies secondary suture.

RESULTS OF LATE OPERATION

Many of our 60 suture operations could not be done, for reasons outside British control, until from 9 months to $2^1/_2$ years and even longer after wounding. After such long delay it seemed doubtful whether the axons could regenerate along the shrunken nerves, and the end-organs function again. Consequently, only the most severe cases were operated on in the hope of obtaining a little recovery; partial lesions were not resected.

The Nerve-injury Centres very kindly supplied follow-up data of patients who were repatriated, and arranged for us to examine them 3 years or more after operation. We were surprised to find that, in general, there had been considerable recovery in proximal muscles, especially the wrist flexors, but less in long digital muscles; there was, however, no recovery in the intrinsic muscles, though slight contractions were sometimes seen in the thenar muscles.

The question of late operation should be decided, as Platt (1921a) pointed out, chiefly in relation to the muscles affected. It is worth doing for recovery in proximal muscles and perhaps long digital muscles, but not the intrinsic muscles—i.e., only for high lesions. The fact that certain muscles show some recovery after such a long time is no reason for delaying operation, but it is important to know, as was found after the 1914–18 war, that muscle-fibres may recover moderate function after being denervated for 3 years.

There is usually recovery, throughout the area, of a little coarse touch, pain, and enough temperature sensibility to prevent burning, but its quality as regards localisation and discrimination is very poor; hence sensory loss is hardly a reason for later operation.

SENSATION

In the management of nerve injuries it is sufficient to examine sensation with a sharp pin. The sensation is easily assessed, and comparison should always be made with the corresponding area on the opposite limb. The patient easily recognises whether the prick is normal, is less sharp than normal, is unpleasant and radiates, feels blunt, is felt only occasionally, or is not felt at all; with a drowsy or uncoöperative patient the response can usually be assessed as normal, over-reaction, slight, or absent. The severest test for absence of sensation is compression of the digits. Such simple descriptions are easily understood and are sufficient. They avoid, on the one hand, that comprehensive and inadequate term "sensory loss," which may mean anything from slight impairment to complete loss, and, on the other, an unnecessarily detailed examination of other kinds of sensation, which adds no useful information. The discriminative forms of sensation are usually more severely affected and are too sensitive to be considered when deciding about operation, because a slight partial lesion should never be excised in an attempt to obtain perfect recovery. Postural sense, which is conveyed by large fibres closely associated with motor nerves, is readily affected, as in neurapraxia (Seddon 1943); it shows whether or not the nerve is normal, but it should not be used for assessing serious damage requiring operation.

The slight recovery of sensation on the palm and non-digital areas a few weeks after injury, due to fibres growing in from the surrounding normal nerves, is well known and has been the subject of important anatomical studies by Weddel et al. (1941). This encroachment must not, at a later stage, be confused with true regeneration. The clinician's attention should always be focused on assessing the severity of the sensory loss on the digits and not on mapping out the whole boundary of the affected area or its shrinkage. Clinically, it is more important to know the quality of sensation on the fingers than the outline of the affected area on the palm; indeed, it would not matter if palm sensation were never examined.

VULNERABILITY OF MOTOR AND SENSORY FIBRES

It is well known that the fibres of motor nerves, both efferent and afferent, are more vulnerable to injury than are cutaneous sensory fibres; and it appears that the difference depends on their diameter, the large motor fibres being the more easily damaged (Gasser and Erlanger 1929, Seddon 1943). After injury of a mixed nerve muscular power is always affected as much as, or more than, cutaneous sensibility.

It is rarely known just how the injuring force affected the nerve, except in the case of incised wounds and tourniquet compression—e.g., whether the velocity of the missile was still high or nearly spent, and whether the nerve was compressed, torn, hit a glancing blow, affected by a "near-miss," or injured by traction or indirectly through a fracture. The actual mechanism no doubt influences the nature of the structural damage to fibres—i.e., whether neurapraxia, axonotmesis, or neurotmesis—and which types of fibres are affected as regards function.

After axonotmesis motor paralysis may be complete before cutaneous sensibility is affected, from which it can be assumed that the motor sheaths are also unbroken and spontaneous recovery will occur; moreover, sensation also may be totally lost without disruption of fibre sheaths and recovery be complete. On the other hand, injuries that tear the fibre sheaths are likely to affect both kinds of fibres about equally, but apparently never cutaneous sensory more than motor. Incised wounds produce the same degree of motor and sensory loss, though after slight cuts it is easier to detect a trace of sensory impairment than of motor weakness.

Cutaneous sensation, then, is more important than muscular power in assessing the basic severity of nerve injuries, and before deciding to operate greater attention should be given to spared sensation than to the more obvious muscular paralysis, for much of the latter may well recover spontaneously. The minimal sensory and not the maximal motor loss of function gives the baseline which the surgeon should feel confident of improving before deciding to resect the lesion.

These remarks on the vulnerability of different fibres to injury also apply, in part, to the end-result after recovery. The final sensory impairment is never less than the motor deficiency if digital sensation

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is compared with its true motor counterpart, the power of the intrinsic muscles, and not with that of the proximal muscles. In the absence of axonal confusion there seems to be no difference, as regards recoverability, between proximal and distal muscles, but there is a pronounced disparity after partial recovery with misdirection of axons, whether occurring spontaneously after severe lesions or after suture.

The question of vulnerability is also important in relation to the following factors:

(1) *Tinel's Test.*—If this indicates no sensory regeneration, and there is no spared sensation, it may be assumed there will be no motor recovery; but, if there is good sensory regeneration, there will be a corresponding return of muscular function (Henderson 1948). Though motor fibres are more vulnerable at the time of injury, there is no evidence that they regenerate less easily than sensory fibres. A disproportionate motor-sensory loss immediately after a partial lesion may thus be expected to equalise by regeneration, and Tinel's test therefore indicates the eventual recovery of both.

(2) *Abnormal Innervation.*—The occasional abnormal innervation of intrinsic hand muscles makes sensation more reliable than muscular power in the diagnosis of ulnar and median nerve injuries. Complete sensory loss with virtually normal action of the corresponding intrinsic muscles shows that their innervation is abnormal, and the lesion can be resected without fear of producing paralysis.

(3) *Nerve Topography.*—Our experience is in agreement with the generally accepted view that motor and sensory fibres are scattered diffusely through a nerve, except where the fibres to a branch collect immediately above its origin. When, therefore, only part of a nerve is injured—e.g., by incision—the resulting partial motor and sensory loss is diffuse. Localised patches of disproportionately severe sensory loss do not occur; nor does one muscle remain strong while another is paralysed, except from abnormal innervation or from local damage to muscular branches.

MUSCULAR RECOVERY

It has long been known (Platt 1921b) that after severe nerve lesions there is much less recovery in the distal muscles—e.g., the long and especially the short muscles to the digits—than in those acting on the more proximal joints; and that the return of slight action in proximal muscles is not necessarily followed by any recovery in the distal group. The distinction between proximal and distal muscles has a physiological rather than an anatomical basis.

Partial recovery is considerably greater in muscles activating the wrist and ankle than in the long muscles to the digits, and it is least, and often absent, in the intrinsic muscles of the hand and foot. The difference between various long muscles is well seen after sciatic injuries in the characteristic tardiness, and often absence, of recovery in extensor hallucis longus, as compared with tibialis anticus and the peronei, while extensor digitorum longus is usually intermediate. Whatever the explanation, it can hardly be the level of innervation, for high and low injuries produce the same effect. Nor does it appear to depend on the size of the muscles, because, though the intrinsic muscles are much smaller, there does not seem to be sufficient difference between the various long muscles of the forearm or leg to explain the inequality of their recovery.

Of all muscles those of the tendo achillis recover slight function more easily than any other, even when the reinnervation must be very small, as indicated by persistent paralysis of all other muscles, virtual absence of sensory recovery, and the appearance of the lesion at operation. The common statement that muscles supplied by the peroneal nerve recover badly misplaces the emphasis, which should be on the greater frequency of slight recovery in the calf muscles. In fact, a few fibres so often reach the superficial calf muscles after virtually complete sciatic lesions that we do not necessarily regard the appearance of slight contraction and increasing foot-drop as an indication of further recovery, but rather tend to suspect that it may be a false sign of recovery comparable to the type of Tinel response associated with negligible regeneration (Henderson 1948).

There is little doubt that regenerating axons can bridge a considerable gap in the nerve, as is shown by the stray sensory fibres which can be demonstrated by Tinel's test. Experimentally, Gutmann and Sanders (1942) found in rabbits that nerve-fibres can bridge gaps of up to 36 mm., become myelinated, and produce slight reflex motor function. This probably also occurs clinically. For example, in a case of high complete division of the ulnar and median nerves, proved at operation, a few fibres had evidently crossed a gap of 3 in. in the ulnar nerve, producing slight action in the flexor carpi ulnaris, which had prompted the preoperative diagnosis of a lesion-in-continuity. Perhaps axons to the more proximal, more automatic, or predominantly postural muscles regenerate and function more easily, or supply a larger number of muscle-fibres, than those to the distal muscles, which require more cerebral guidance, mediated through more delicately graded and timed impulses, for their intricate actions.

After nerve injury, no matter how high the lesion, all muscles can recover fully if all axon sheaths are intact (axonotmesis) so that there is no misdirection of fibres; but below a certain percentage of correct reinnervation there is much less recovery of muscles concerned with delicate independent movements of digits, as opposed to coarse strength of the hand or foot, and still more of the elbow or knee. The reason for the striking difference in recoverability after partial reinnervation is not clear. It has been attributed by various workers to (1) the greater distance to the distal muscles, which allows more time for shrinkage of the nerve and degenerative changes in the muscles; this is unlikely, for complete recovery occurs after high axonotmesis, and it has been shown (Seddon 1943) that its quality is better than after low primary suture, though the axons take longer to reach the muscles; and (2) an assumption that the small distal muscles contain fewer muscle-fibres and receive fewer axons than do proximal muscles, and that after partial regeneration insufficient axons reach the distal muscles to initiate visible contraction. It seems reasonable, however, to suppose that, whatever proportion of axons regenerate, both large and small muscles receive this same percentage of their normal supply; and that if this percentage is enough for one muscle it should activate all muscles alike, for the size of a muscle is presumably determined by the amount of work it has to do.

If we may speculate, the unequal recovery of proximal and distal muscles could result from disturbed function at three levels of neuromuscular activity: (1) the muscles; (2) the nerves; and (3) the brain and spinal cord.

(1) *Muscles*

There is no evidence that the degree of muscular recovery depends on inherent differences between the various muscles or their nerves. It has been suggested that irreversible changes may occur sooner in distal muscles, but that is improbable within the time required for nerve-fibres to reach them after reasonably early operation. Little is known about the onset of degeneration in different muscles and the possibility of recovery after prolonged denervation. Bowden and Gutmann (1944) found, from morphological studies of denervated human muscle, that up to 3 years few if any muscle-fibres undergo complete degeneration, though there may be very great shrinkage of fibres and increase of connective tissue; they add, however, that reinnervation and recovery of function may be impossible. Clinically, all wasted muscles recover completely if correctly

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reinnervated, and some muscles recover moderate power after being denervated for as long as 3 years.

(2) *Nerves*

Nerves to distal muscles may well contain a greater percentage of afferent fibres than do those to proximal muscles, which would increase the wastage of efferent fibres owing to axonal confusion. Perhaps distal muscles are supplied principally by the largest motor fibres, whose maturation is likely to be less complete than that of the smaller efferents; if so, this would partially explain their poorer recovery. The unequal recoverability of different groups of muscles may give a clue to the meaning of the unexplained bimodal fibre-size histogram of efferent nerve-fibres.

The downgrowth of axons has always been regarded as the most conspicuous sign of nerve regeneration, whether demonstrated histologically in animals or by Tinel's test in man, but that is not enough. Recent experimental studies of the factors influencing nerve regeneration, especially by J. Z. Young and his associates, and investigations into the electrical signs of nerve conduction (Erlanger and Gasser 1937) have demonstrated the importance of obtaining full maturation of fibres for full recovery of function. For example, the conduction-rate of a nerve-fibre depends on its diameter, and it has been shown that after suture the normal fibre-size histogram is never restored (Gutmann and Sanders 1943). Perhaps proximal muscles can function more easily than distal muscles when maturation is incomplete, as always happens when the fibre sheaths have been broken. Only after axonotmesis are there full maturation and full recovery of function, as has been shown in animals after simple crushing of a nerve.

(3) *Brain and Spinal Cord*

Central mechanisms for the initiation and control of movement require a good flow of afferent information, especially from muscles, to regulate the outgoing motor impulses, particularly to the distal muscles for their complicated actions. When afferent fibres are disarranged at the nerve lesion, the sensorimotor cortex cannot function properly, because of insufficient or conflicting afferent impulses. The resulting impairment of central activity does not affect the whole limb equally but principally those functions with most cerebral representation—i.e., distal functions. Central representation and control are not the same for all parts of a limb, and it is assumed that for distal muscles they are more complex and at a higher functional level, requiring more complete afferent information, than for the more automatic proximal functions—corresponding to the "most voluntary" and the "most automatic" movements of Hughlings Jackson (1931). It is probable that, even though some efferent fibres re-establish connexions with muscles, voluntary contraction cannot be initiated without a certain threshold level of afferent impulses from the muscles, which, after severe lesions or suture, is less easily attained for distal muscles. The primary importance of sensation in initiating the more highly organised voluntary movements was shown many years ago by Mott and Sherrington (1895) in the de-afferented limb of the monkey; sensory denervation by dividing the posterior spinal roots paralysed voluntary movement of the distal part of the limb but not of the proximal muscles. Again, after nerve injury electrical stimulation of the exposed nerve during recovery produces contractions before they occur reflexly or voluntarily.

Such speculation about the importance of cerebral control in the recovery of distal muscles may be allowed for other reasons. For instance, the greater weakness of distal muscles has a similar distribution to that seen in hemiplegia of central origin. Moreover, if analogy with phantom limbs may be used, the ease of inducing voluntary movements in the phantom, which is regarded as reflecting the degree of normal voluntary control of different muscle groups (Henderson and Smyth 1948), corresponds to the presumed importance of cerebral control in the recovery of muscles. Phantom limbs also show the primary importance of the sensory cortex in initiating voluntary movements.

It is believed, therefore, that defective muscular recovery is due primarily to insufficient and incorrect axonal regeneration, both of efferent fibres, leading to direct loss of power, and of afferent fibres, causing inadequate cerebral coördination, which further impairs the function of those efferent fibres that have reached the muscles; and that the disparity in recovery between proximal and distal muscles is due partly, if not mainly, to the different degrees of their cerebral control. There can be little doubt that the more complex neuronal mechanism for controlling distal muscles is more easily disturbed, and requires a much greater degree of recovery peripherally before it can begin to function, than that for proximal muscles. Partial regeneration gives valuable recovery in proximal muscles but is not likely to do so in distal muscles, the reinnervation of which must be nearly complete to be useful. The performance of intricate independent digital movements requires a high degree of coördination and cerebral guidance, which, in turn, depend on virtually complete restoration of afferent connexions.

CONCLUSION

A nerve is a complex structure containing many thousands of fibres of different sizes and functions. The degree of functional recovery after injury depends on how many of the fibre sheaths have been broken and how many regenerating axons reach their own or similar end-organs. When the fibre sheaths remain intact (axonotmesis), the axons regenerate correctly, and functional recovery is complete. On the other hand, when most or all of the sheaths have been broken, after either a severe lesion or suture, complete recovery is impossible, because of the inevitable confusion and wastage of fibres, many of which are either stranded or enter wrong channels.

After suture, with optimal conditions of time and technique and a good downgrowth of axons, the over-all recovery depends partly on the similarity or diversity of functions subserved by the nerve and partly on the level of the lesion—i.e., whether it is above or below the proximal muscles. In a mixed nerve, such as the median, the wastage of axons is greater, and functional recovery correspondingly less, than in a predominantly motor nerve, such as the radial; the latter has the additional advantage that its muscles have simple, similar actions, which require less central coördination, thus minimising the effect of axon confusion.

Inequality of functional recovery is seen not only as between various nerves but also within the territory of one nerve after high lesions, when there may be a striking difference between proximal and distal muscles. This disparity does not appear to depend on the length of regenerating axons, the size of muscles, or, within limits, delay in suture or degeneration of muscles; nor does it seem to depend entirely on insufficiency of efferent fibres through being stranded or misdirected at the lesion. Its distribution resembles that of the muscular weakness in hemiplegia of cerebral origin, and it corresponds to the degree of normal voluntary control of the various muscle groups. It seems that after nerve injuries the disabling effect of defective central control and coördination, through loss and confusion of afferent information to the cerebral cortex, is greater for the more complicated distal functions than for proximal functions.

The importance of central coördination of peripheral functions in the final stages of full recovery, especially

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of sensation, is well recognised, but we think its deficiency after partial recovery has not been sufficiently emphasised as a major factor in the poor recovery of distal muscles. Only when recovery is virtually complete can the complicated central mechanisms function properly in coördinating not only the affected muscles with their antagonists and synergists supplied through normal nerves but also the various recovering and perhaps antagonistic muscles—e.g., interossei—within the territory of the injured nerve.

In addition to axonal confusion and defective cerebral control a third factor is present, which also cannot be eliminated—i.e., incomplete maturation of regenerating fibres in the peripheral segment. There is ample experimental evidence that complete maturation and full recovery of function never occur after the axon sheaths have been broken.

As regards the muscles, however, we believe that, within reasonable time limits, structural changes in denervated muscle-fibres have much less effect on recovery than have the factors already mentioned.

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HÆMOLYTIC DISEASE OF THE NEWBORN DUE TO ANTI-A ANTIBODIES

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THE knowledge that an Rh blood-group incompatibility between mother and infant is the most common cause of hæmolytic disease of the newborn has prompted many workers to reconsider the possibility that the disease may also be caused by anti-A or anti-B antibodies incompatible with the fœtal red cells. Evidence that such ABO incompatibilities are responsible for the disease is difficult to obtain. The presence of immune anti-A and anti-B agglutinins in the maternal serum, even in high titre, does not establish the diagnosis of hæmolytic disease of the newborn in the infant, because such agglutinins are produced even when the infant is normal, as in most instances of heterospecific blood-group pregnancy (Boorman et al. 1944, 1945, Tovey 1945).

Many cases have been reported as examples of hæmolytic disease of the newborn caused by maternal anti-A and anti-B agglutinins incompatible with the infant's red cells, but in our opinion there is insufficient evidence in most of these cases to support the diagnosis. Much of the earlier work was done before the complexity of the rhesus group of antigens was known and before tests for antibodies other than those causing agglutination in a saline medium had been devised; thus the possible presence of such antibodies in the sera of some of these mothers cannot be excluded. Probably the best evidence that an infant's jaundice or anæmia is due to a blood-group antigen-antibody reaction is the demonstration of abnormally rapid elimination from the infant's circulation of transfused red cells containing the blood-group antigen in question; such evidence has been presented by Mollison (1943) for the Rh system.

Two cases are described below in both of which it was suspected that hæmolytic disease of the newborn was due to anti-A antibodies. Experimental evidence in support was obtained by the failure of transfused group-A blood to survive normally in the first infant's circulation, and by the elution of anti-A antibodies from the tissues of the second infant.

CASE-RECORDS

Case 1.—A primipara, aged 29, had had no major illness and had no knowledge of ever having been given blood intramuscularly or intravenously. The Kahn test on her serum was negative. Her pregnancy was normal throughout, and she was delivered of binovular twins on May 25, 1948. The girl weighed 5 lb. 9 oz. at birth and showed no jaundice or anæmia at any time. The boy weighed 6 lb. 3 oz. at birth and his condition gave no cause for comment until about June 3, when he was seen to be very pale. On June 5, when he was 12 days old, his hæmoglobin was 65% (Sahli), and we were asked to investigate the possibility of his condition being due to hæmolytic disease of the newborn. The boy was apyrexial and, apart from his striking pallor, clinically normal; there was no palpable enlargement of liver, spleen, or superficial lymph-glands, no jaundice, œdema, cyanosis, petechial hæmorrhages, or abnormal colour of fæces or urine. On June 8 there were 1,760,000 red cells and 14,400 white cells per c.mm., with a reticulocytosis of 12%; differential leucocyte-count: neutrophil polymorphs 18%, neutrophil band cells 4·5%, eosinophils 0·5%, basophils 0·5%, monocytes 5·5%, lymphocytes 55%, and disintegrated cells 16%. There were 4 normoblasts per 100 leucocytes, and the erythrocytes showed macrocytosis, anisocytosis, and polychromasia.

Serology

The mother was group-O Rh-positive (CDe/cde), the father group-A Rh-positive, the normal twin group-O Rh-positive, and the anæmic twin group-A Rh-negative. A direct Coombs test on the boy's red cells was negative.

No atypical antibody was detected in the maternal serum against a panel of standard group-O red cells by the saline, albumin (Diamond and Denton 1945), and anti-human globulin (Coombs et al. 1945) techniques. These standard cells contained antigens known to be capable of reacting with anti-D, anti-C, anti-E, anti-d, anti-c, anti-e, anti-M, anti-N, anti-P, anti-Lutheran, and anti-Lewis antibodies if any of these had been present in the serum. The anti-A and anti-B agglutinins in the mother's serum were titrated in saline when the case was first referred to us 14 days after delivery. The titre for both agglutinins was 2000. The result of a titration for hæmolysins showed lysis up to a dilution of 1/4 against group-A cells; the serum did not lyse group-B cells.

The red cells of the anæmic boy taken on the 10th day after birth gave a negative direct Coombs test. No sample of serum large enough to test for free anti-A agglutinin or lysin was obtained.

When the boy was in need of treatment, a fluid was transfused which consisted of about equal quantities of bloods of groups A Rh-positive and O Rh-negative. Thus the survival of group-A cells could be compared with that of group-O cells. If the group-A cells should be eliminated more quickly than the group-O, it would strongly suggest that the mother's anti-A antibody was the cause of the hæmolytic disease in the child. The blood mixture was made by removing the supernatant plasma from two appropriate bottles of blood. The red cells from both bottles were then washed and pooled, and the mixture was made up to 500 ml. with physiological saline solution; the infant was transfused with 150 ml. of this preparation. The times of survival in the infant's circulation of the two kinds of transfused red cells were compared by a modified Ashby technique (Dacie and Mollison 1943). A potent anti-A serum was used to agglutinate both the infant's own cells (A Rh-negative) and the transfused group-

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A cells, so that the transfused group-O cells could be counted. A second count was made using an anti-Rh serum (type anti-D) which agglutinated only the transfused group-A Rh-positive red cells, so that the unagglutinated cells counted included both the infant's own cells and the transfused group-O cells. By subtraction of this value from the total red-cell count the number of transfused group-A red cells could be estimated.

Red-cell counts on samples of heparinised capillary blood obtained at intervals up to five days after transfusion showed 4,560,000 cells per c.mm. 24 hours after transfusion, which by the 5th day had fallen to 3,130,000 per c.mm. The count of the transfused group-O cells remained steady, throughout the whole period, between 1,400,000 and 1,290,000 per c.mm., while the value for the transfused group-A cells was 760,000 per c.mm. 24 hours after transfusion and nil on both the 4th and 5th days.

Though the fall of 1,430,000 per c.mm. in the total red-cell count can be explained in part by the disappearance of the 760,000 transfused group-A cells per c.mm., the further reduction of 670,000 per c.mm. almost certainly represents the disappearance of some of the infant's own group-A cells, since the transfused group-O cells were not being eliminated.

Since the number of group-A Rh-positive red cells circulating was determined by a subtraction method known to have a wide margin of experimental error and not by direct count, a qualitative result was also obtained by noting for how long after transfusion agglutination of the group-A Rh-positive red cells could be seen in the counting-chamber when the blood was tested with anti-D agglutinating serum. On the two last occasions when tests were made after transfusion no agglutinated red cells were seen. The accuracy of these two methods was assessed by determining how small a proportion of Rh-positive red cells could be detected both quantitatively and qualitatively in mixtures of Rh-negative and Rh-positive blood made up in known proportions. It was found that, whereas it was impossible to detect smaller quantities than 25% of the transfused Rh-positive red cells by the quantitative method, the qualitative method was sensitive enough to detect a 6% survival of red cells. This means that, though a value of nil was obtained by the quantitative method for the transfused group-A Rh-positive red cells 7 days after the transfusion, there might have been as many as 200,000 per c.mm. of such cells present in the total of 760,000 per c.mm. then surviving. However, since no agglutination of cells with the anti-D serum occurred at this point, there could not have been more than 10,000 per c.mm. still surviving. Thus it can be concluded that, while there was still about 100% survival of group-O cells 7 days after the transfusion, almost all (at least 94%) of the group-A cells had been eliminated.

The development of moderate anæmia, the signs of rapid red-cell production, and the absence of hepatic or splenic enlargement are all characteristic of the least severe type of hæmolytic disease of the newborn.

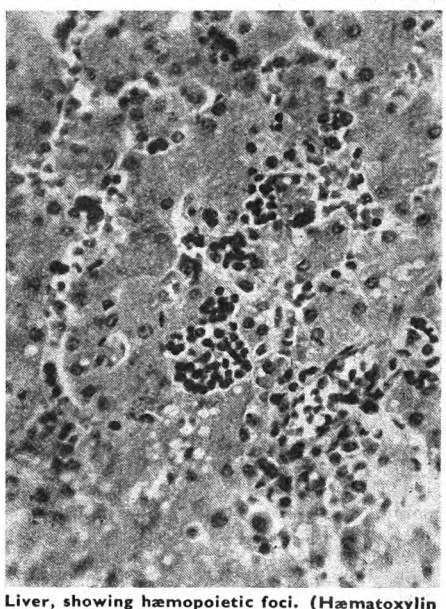
The destruction of almost all the transfused group-A cells and some of the patient's own group-A cells despite the normal survival of the transfused group-O cells is strong evidence that the anti-A antibody in the mother was the cause of the disease in the child. It is interesting to note that the twin, who was group-O, and therefore could not be affected by the maternal anti-A antibody, did not become anæmic.

Case 2.—A woman, aged 43, had never been transfused or injected with blood. Her general health had always been satisfactory. Both Kahn and Wassermann reactions of her serum were negative. She had been pregnant three times and had carried all the infants to term. Her first child, born in August, 1944, lived only 8 hours, death being due to intracranial injury at birth. Her second child, born in April, 1946, was not noticed to be abnormally jaundiced during the first week of life, nor is there any report of subsequent pallor; he has had no serious illness and appears healthy.

Her third child, a boy, was born in November, 1947. Pregnancy and labour were normal, and the infant, who weighed 7 lb. at birth, showed no cyanosis, jaundice, petechial hæmorrhage, or œdema. The placenta had not been weighed, and no information about its appearance was available. Jaundice, however, appeared in less than 24 hours and steadily increased until the fourth day, when the child developed a moderate stiffness of the neck and had one spasm of generalised extensor rigidity. The jaundice by that time was severe but thereafter began to fade slightly. No abnormal colour of either fæces or urine was noted at any time.

We first saw the child in consultation on Nov. 5, 1947, when he was moderately jaundiced, with some cyanosis, particularly of the extremities. The feet were grossly œdematous and dusky blue. Coarse rhonchi could be heard from a distance. There was no palpable enlargement of either spleen or liver. The neck muscles showed slight extensor spasm, while the arms and legs were completely flaccid at the larger joints. The infant died two hours later.

Blood samples were taken for hæmoglobin estimation (125% Haldane) and serological investigation and blood films were made, but no further hæmatological investigations were attempted, because of the urgency and gravity of the infant's condition. The film showed red cells well filled with hæmoglobin and varying much in size, with macrocytes predominating, no poikilocytes, well-marked polychromasia, occasional cells containing Howell-Jolly bodies, and numerous immature red cells. Many of the leucocytes were damaged. A differential count of 500 nucleated cells gave: pro-erythroblasts 0·2%, normoblasts (early) 0·4%, (intermediate) 4·4%, (late) 44·8%, red cells with Howell-Jolly bodies 2%, disintegrated cells 38·8%, neutrophil polymorphs 2·2%, neutrophil metamyelocytes 4%, eosinophil polymorphs 0·4%, lymphocytes 2·4%, and monocytes 0·4%.



Liver, showing hæmopoietic foci. (Hæmatoxylin and eosin; high power.)

Necropsy Findings

At 26 hours after death there was deep yellow staining of the skin, subcutaneous tissues, and fat. There was no evidence of umbilical sepsis, birth injury, submucous or petechial hæmorrhage, or congenital abnormality. The peritoneal, pleural, and pericardial sacs each contained a little yellow fluid. The abdominal organs appeared normal, and neither the liver nor the spleen was obviously enlarged. The biliary apparatus was normal, and the bile-ducts were patent. No naked-eye abnormality was detected in the stomach, intestines, pancreas, kidney, or adrenal glands. The thoracic contents, except for bilateral basal congestion of the lungs, appeared normal. There was no sign of intracranial hæmorrhage, and the brain, except for bright-orange staining of the basal subthalamic, dentate, and olivary nuclei, looked normal. This pigmentation was sharply localised, neither the cortex nor the white matter being stained. Portions of the solid organs were immediately put in physiological saline solution until the serological experiments described below were performed.

Histology.—In the liver many of the hepatic cells contained granules of bile pigment, and there was much bile in the intercellular canaliculi. There was a moderate degree of hæmosiderosis. There were many small widely distributed extravascular foci of immature blood-cells (see figure), mainly of the red-cell series. In the spleen many phagocytic cells contained bile pigment, and there were numerous erythroblasts among the cells forming the red pulp; there were no compact foci of hæmopoiesis. In the brain the cortex of the right frontal lobe showed no abnormal cellular pigmentation or degeneration and no intravascular clumping of red cells. The right olivary nucleus showed one small (1 mm. diameter) focus of necrosis without cellular infiltration but was otherwise normal. Other parts of the brain were not examined histo-

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SEROLOGICAL TESTS ON TISSUE ELUATES

Eluate from	Tests											
	Agglutinin		Lysin		Coombs		Albumin		Blocking			
	A cells	B cells	A cells	B cells	A cells	B cells	A cells	B cells	A cells + anti-A serum	A cells treated with eluate + anti-A serum	B cells + anti-B serum	B cells treated with eluate + anti-B serum
Pigmented brain tissue	−	−	−	−	+	−	−	−	..	..	..	..
Non-pigmented brain tissue	−	−	..	..	(+)	−	..	..	+	(+)	++	+
Liver	−	−	..	..	++	−	..	..	+	−	(+)	w
Kidney	−	−	..	..	+	−	..	..	+	−	+	+
Spleen	−	−	..	..	++	−	..	..	+	w	+	(+)
Lung	−	−	..	..	++	−	..	..	..	..	..	..

Read microscopically:
++, very large clumps of agglutinated cells.
+, large clumps.
(+), smaller clumps with many free cells.
w, clumps of 3–5 cells evenly distributed.
−, no agglutination.

logically, since most of this tissue was used for the serological experiments.

Serology

The mother was group-O Rh-positive (R_2) and her infant group-A Rh-positive (R_2r). The father was group-A Rh-negative (rr), and the previous child group-A.

The infant's red cells on the 4th day after birth gave a strongly positive direct Coombs test, showing that there was an antibody attached to the cells. The infant's serum produced no lysis or agglutination of group-A red cells, and the indirect Coombs test against standard A, B, and O cells was negative. The infant died before a larger blood sample could be obtained for elution experiments.

No atypical antibody was detected when the maternal serum was tested against the same panel of standard group-O red cells as in case 1 by the saline, albumin, and anti-human globulin techniques.

The anti-A and anti-B agglutinins in the mother's serum taken both on the 4th and 10th days after delivery were titrated in both saline and serum diluents. The titration method used was that described by the Medical Research Council (1943). On the 4th day after delivery the anti-A titre was 512 in both diluents, while the anti-B was 32 in saline and 64 in serum. By the 10th day the anti-A titre had risen to 2000 and 4000 in saline and serum respectively, the anti-B remaining at 64 in both diluents. The group-A cells in the tubes containing the serum diluent showed the "tightening of agglutination" characteristic of immune antibodies (Boorman and Dodd 1947). This fact, together with the finding of an increased titre of the anti-A agglutinin at the 10th day, indicated the presence of immune anti-A antibody in the mother's serum.

An attempt to demonstrate non-agglutinating anti-A antibody in the maternal serum by the blocking technique (Race 1944, Wiener 1944) was unsuccessful; it was impossible to reduce the activity of the high titre agglutinating antibody sufficiently by heating the serum to allow the demonstration of any blocking antibody that might be present.

The serum was also tested for anti-A hæmolysin by making serial dilutions in saline solution, adding 1 volume of human complement and 1 volume of standard group-A cells (diluted to give about 4% suspension) to each tube and incubating at 37°C for 1 hour. Control titrations with group-B cells were done at the same time. A moderate degree of lysis specific for group-A cells took place up to a dilution of 1/2 of the maternal serum.

Tissue eluates were made from portions of the infant's liver, kidney, spleen, lung, and the pigmented and non-pigmented parts of the brain by the following method: A piece of tissue was ground with a pestle and mortar to such a degree of fineness that a suspension of ground tissue could be drawn into a capillary tube 1 mm. in diameter. This suspension was washed six times in at least twenty times its volume of distilled water and than washed twice in physiological saline solution. Each washing was effected by shaking the ground tissue in the water or saline solution, centrifuging the mixture at about 2500 revs. per min. and then discarding the supernatant fluid. A portion of this ground washed tissue was heated for half an hour at 56°C with about twice its volume of physiological saline. The preparation was then centrifuged, the temperature being maintained at 56°C with a hot-water jacket, and the supernatant fluid (the eluate) quickly removed. It was then tested for antibody content with red cells of groups A and B by the agglutination, Coombs, albumin, blocking, and lysin techniques.

The results of these tests are set out in the accompanying table. It was considered important to duplicate the Coombs and blocking tests on as many specimens as possible; consequently there was insufficient material for the other tests to be made on every eluate. Eluates derived from all the tissues gave positive indirect Coombs tests with group-A red cells but not with any of several samples of red cells of groups B and O. This suggested that the eluates had sensitised the group-A red cells specifically, owing to the presence in them of an anti-A antibody. None of the eluates caused direct agglutination of group-A or group-B red cells. There was sufficient eluate made from pigmented brain tissue to test it in addition by the lysin and albumin techniques, with which it gave negative results.

Though from the table it might seem that the greatest amounts of antibody were found in the lung, liver, and kidney, it is impossible from these experiments to make a quantitative assessment. The amount of tissue substance used in the preparation of eluates was not measured; moreover it is difficult to interpret quantitatively results obtained by the Coombs technique.

The fact that the antibody could only be detected in the eluates by the Coombs technique suggested that it was present in the non-agglutinating or blocking form, and an attempt to confirm this was made using the blocking technique described by Race (1944) and Wiener (1944). One volume of a 2% suspension of standard group-A red cells was mixed with one volume of the eluate to be tested for blocking antibody, and the mixture incubated at room temperature for 1 hour. One volume of a standard anti-A serum which would normally agglutinate standard red cells was added to the mixture, and, after shaking, the test was allowed to stand for a further 1 to 2 hours. A control tube containing one volume of group-A red cells, one volume of the anti-A serum, and one volume of saline solution, but without the eluate, was also set up and allowed to stand for the same time. An inhibition or definite reduction of the agglutination in the tube containing eluate as compared with the control was taken as evidence of the presence of a blocking antibody in the eluate.

Liver, kidney, and spleen eluates gave positive results by this method, but the result of this test on the brain eluate was equivocal, since a reduction of the degree of agglutination from + to (+) (see table) is within the limits of experimental error. In the control tests with group-B cells there were some small differences in the strength of agglutination between group-B cells which had been treated with eluate and those which had not, but these differences were within the limits of experimental error. These results also suggest that the anti-A antibody detected in the eluates was of the non-agglutinating or blocking type.

To confirm that the antibody had been eluted from the tissue cells and was not derived from the tissue fluid, the last saline washing of each tissue was tested against red cells of groups A and B by the saline agglutination and Coombs anti-human-globulin techniques; in every instance these tests were negative.

All the serological evidence indicates that the anti-A antibody was eluted from the tissue cells of the organs. The

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only other possible source would be the red-cell stromata which remained mixed with the other tissue cells after washing. That this quantity of stromata must have been very small and therefore unlikely to have contributed appreciable anti-A antibody to the eluate is shown by a control experiment in which group-A blood was mixed with group-B tissue and the mixture subjected to the same treatment as the infant's organs, after which it was impossible to demonstrate any group-A activity by the inhibition technique. Anti-A and anti-B antibodies are not normally attached to the infants' tissues in cases of heterospecific blood-group pregnancy. We have tested several hundred cord-blood samples from such cases in which the direct Coombs test was negative, showing that there was no antibody attached to the red cells. Moreover attempts to elute anti-B antibody from the tissues of a group-B infant whose mother was group-O were unsuccessful.

The diagnosis of severe hæmolytic disease with early jaundice and kernicterus seems well founded on clinical, hæmatological, anatomical, and serological grounds. The infant became deeply jaundiced within 24 hours of birth, developed signs attributable to kernicterus when 3 days old, and died on the 4th day of life. The limited hæmatological data strongly support the diagnosis. The hæmoglobin was estimated at 125% (Haldane), and a stained blood film showed 100 nucleated red cells, many of them very immature, for each 100 leucocytes counted; the red cells showed macrocytosis and polychromasia without poikilocytosis. The bile pigment in the hepatic cells, the characteristic distribution of hæmopoiesis in the liver, and the absence of congenital abnormality of the bile-ducts or evidence of neonatal sepsis at necropsy all support the diagnosis of hæmolytic disease of the newborn.

On the evidence of sensitisation of the infant's group-A red cells by an antibody, the finding of an anti-A antibody in the organ eluates, and the apparent absence of atypical antibodies from the maternal serum, there seems little reason to doubt that it was the maternal anti-A antibody that was responsible for hæmolytic disease of the newborn in this case. It is realised that the finding of antibodies in the tissue eluates, though of great interest, does not prove that they became attached to the cells concerned during life, or that they caused tissue damage.

SUMMARY

Two cases are described in which hæmolytic disease of the newborn is believed to have been due to anti-A antibodies.

In case 1 rapid destruction of group-A cells in an anæmic infant's circulation, with normal survival of group-O cells, was demonstrated.

In case 2 anti-A antibodies were recovered from the tissue cells of a deeply jaundiced infant whose red cells gave a positive direct Coombs test, and who died on the 4th day of life; at necropsy the brain showed kernicterus, and the other histological findings were consistent with a diagnosis of hæmolytic disease of the newborn.

We wish to thank Mr. L. G. Higgins and Dr. J. W. C. Simmonds for allowing us to investigate case 1 and for obtaining blood samples from the baby; Dr. W. A. Carey for access to case 2; Dr. W. G. Millar for preparing sections of tissues; Dr. A. Mayer for assistance in the interpretation of histological findings in the nervous tissue; Dr. J. L. Loutit and Dr. P. L. Mollison for their helpful suggestions; Dr. M. Mackay for preparing the washed packed cells for case 1 at very short notice; and Mr. E. J. Lucas for the photograph.

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STREPTOMYCIN IN THE TREATMENT OF ACTINOMYCOSIS

REPORT ON THREE CASES

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THE treatment of actinomycosis with streptomycin was reported by Costigan [1] and by Jacobson and Cloward [2] at a time when penicillin and sulphonamides were considered to be the most potent drugs in the treatment of this disease.

The case described by Costigan was said to be actinomycosis of a cervical gland following a dental extraction, the actinomyces being found in scrapings from the tooth socket. After five days' treatment with streptomycin the condition was apparently arrested, though previous treatment with penicillin and a sulphonamide had not influenced the disease. Jacobson and Cloward described a case which was eventually diagnosed as actinomycosis of the central nervous system, the actinomyces being found in the cerebrospinal fluid. Treatment was with penicillin, sulphadiazine, and streptomycin, which was given both intramuscularly and intrathecally for five days to a total dosage of 25 g., and surgery was also used; however, the penicillin and sulphadiazine appeared to be the more important therapeutic agents in this case, and their use was continued for over a month.

The report of Costigan's case suggested the use of streptomycin in the following three cases.

Case 1.—A man, aged 27, had a week's diarrhœa in April, 1946, the stools containing red blood and mucus. He was living at this time in a country district of Lincolnshire but was employed as a welder. He remained well until December, 1946, when he developed an aching pain in the right groin, associated with alternating diarrhœa and constipation; he passed no blood or mucus. There was also malaise, sweating, increasing pallor, and nocturnal frequency. In April, 1947, his renal tract was investigated, but no abnormality was found. In May, 1947, an abscess developed in his right groin and was later incised. About a fortnight later a further drainage was done in the right loin near the iliac crest, and both wounds formed persistent discharging sinuses. In August, 1947, the patient developed epigastric pain, with loss of weight, sweating, and dyspnœa, and a fluctuant tumour formed in his epigastrium. He became seriously ill and was admitted to hospital on Oct. 27. His temperature ranged from 102 to 104°F, the sinuses in the right loin and groin still discharged, the liver was enlarged, and the fluctuant tumour in the epigastrium persisted. His red-cell count was 2,850,000 per c.mm.; Hb 46%; white-cell count 18,600 per c.mm. (polymorphs 73%). A clinical diagnosis of actinomycosis was suggested. Therapy was started on Oct. 31, and ultimately included surgery, penicillin, sulphonamides, and potassium iodide, as well as blood-transfusions and liver injections for the anæmia. Six surgical operations were performed, but actinomyces was not found. On Nov. 3 the epigastric swelling was incised and found to be a liver abscess containing much foul-smelling bright-green pus; on the 15th the right pleura was explored and 5 oz. of sterile blood-stained fluid found, and on the 23rd the chest wall, which had become infected, was drained. On Jan. 5, 1948, a subphrenic abscess was opened, the cavity measuring 7×5×5 in.; on the 19th an abscess in the lumbar region was opened; and on the 27th the right loin appeared distended and was explored, but no pus was found.

By February, 1948, the patient weighed 109 lb., the sinuses were healed, some abdominal pain persisted, and the liver and spleen were palpable. When he discharged himself on March 13 he had received 249 g. of sulphonamides and 41 mega units of penicillin; potassium iodide, which had been started on Nov. 28, 1947, and had reached a dosage of gr. 200 daily, was continued until his discharge. The patient said

1. Costigan, P. G. *Canad. med. Ass. J.* 1947, **56**, 431.
2. Jacobson, J. R., Cloward, R. B. *J. Amer. med. Ass.* 1948, **137**, 769.

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that for two more months he took 4 g. of a sulphonamide daily.

He maintained his clinical improvement into April, 1948, despite some slight discharge from the right groin, and gained 7 lb. in weight, but during April he developed a dry cough. By June the cough had become productive, he had pain in the back, was increasingly pale, and was losing weight; these symptoms were unaffected by a course of 'Sulphatriad.'

On Aug. 2 he was admitted to the West Middlesex Hospital. At this time he was dyspnœic and coughing up 6–8 oz. of foul-smelling yellow mucopurulent sputum daily; he had an aching lumbar pain and was tender in this area; and he weighed 110 lb. He was thin, ill, and pale, had well-marked fœtor of the breath and a temperature of 101°F. His blood-pressure was 120/70 mm. Hg. There was no clubbing of the fingers. The trachea was central, but there was diminished movement, with an impaired note and râles, at the base of the right lung. There was a reddened area below the empyema scar on the right, and a sinus formed here later. The liver edge was palpable, firm, and tender. A sinus in the right groin was discharging thin yellow pus. On Aug. 10 a further sinus in the right loin discharged. On the 16th the area below the empyema scar broke down and appeared to be connected to a bronchus, since after it opened his cough lessened and became unproductive, and on Sept. 12, when it healed for a few days, the cough again became productive. On Aug. 20 the sinus near the right iliac crest reopened. On Sept. 10 a fluctuant area 3 in. in diameter formed in the left lumbar region but did not discharge.

While under treatment, before the start of streptomycin, all the sinuses healed except that near the right iliac crest; the fluctuant mass in the left lumbar region also persisted.

Investigations.—Pus taken from sinuses on Aug. 6 and 19 grew a saprophytic staphylococcus. Sulphur granules and organisms morphologically resembling actinomyces were seen. Later *Actinomyces israelii* was grown. Blood-cultures made on Aug. 3, 4, 5, 6, and 9, 1948, grew nothing significant. In a Congo-red test made on Sept. 8, 1948, 44% of the dye was retained in the blood after an hour.

Therapy and Progress.—Except for sedatives and a course of emetine before the actinomyces was found, treatment was at

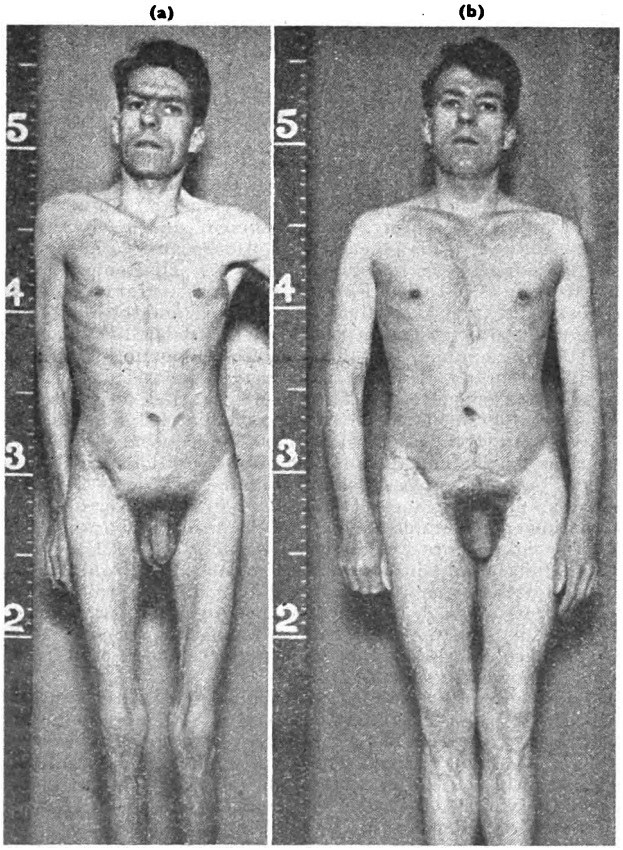

Fig. 1—Case 1: (a) Oct. 6, 1948, after five weeks' treatment with potassium iodide and massive doses of penicillin; (b) Jan. 18, 1949, after treatment with streptomycin.

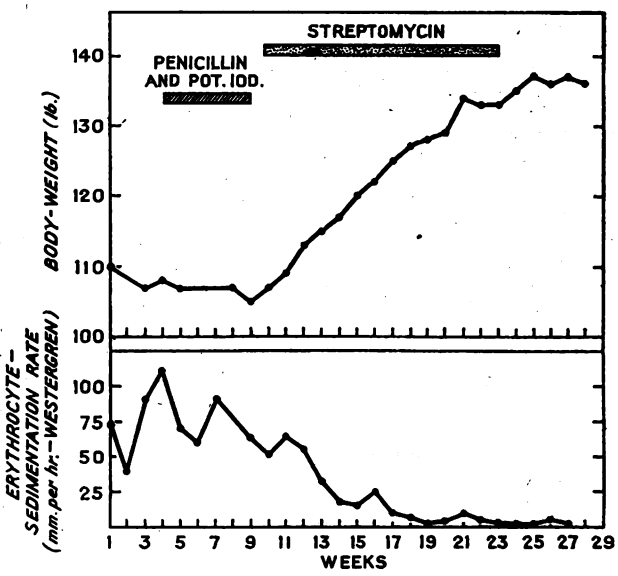

Fig. 2—Weight and erythrocyte-sedimentation rate charts in case 1.

first with penicillin and potassium iodide alone. Both were started on Aug. 26 and continued until Oct. 4, 1948. The dose of iodide was only gr. 90 daily; the penicillin was started at 100,000 units four-hourly (600,000 units daily) and raised on Aug. 31 to 500,000 units four-hourly (3 mega units daily), a total of 102 mega units being given. After having the penicillin the patient appeared less ill, but his temperature remained high, swinging to 103°F in the first month. It remained raised until Oct. 1, after which it was normal. The patient's weight and erythrocyte-sedimentation rate (E.S.R.) are shown in the accompanying figure. On Oct. 4, penicillin and potassium iodide were stopped, so that streptomycin could be tried alone. At this time the patient had improved clinically and was apyrexial, but the sinus at the right iliac crest was discharging, and a painful fluctuant swelling 3 in. in diameter was present in the left lumbar region; his weight was steady at 107 lb., and his E.S.R. was 67 mm. (Westergren) in the first hour. His red-cell count was 4,800,000 per c.mm.; Hb 80%; white-cell count 17,000 per c.mm. (polymorphs 76%, lymphocytes 20%, monocytes 3%, basophils 1%). Biopsy of the buccal mucosa showed no evidence of amyloid tissue. Radiographs of the chest showed only obliteration of the right costophrenic angle; the lung parenchyma was clear. No casts or albumin were found in the urine. Liver-function tests showed damage:

Total plasma-protein 8·7 g. per 100 ml.
Serum-albumin 4·2 g., serum-globulin 4·5 g. per 100 ml.
Albumin/globulin ratio 0·9 : 1.
Alkaline phosphatase 17 units.
Thymol turbidity 22 units.
Thymol flocculation + + + +.
Colloidal gold + + + + +.

Streptomycin was started on Oct. 12, 0·5 g. being given four times a day (2 g. a day) for a month. On Nov. 12 the dose was halved and continued until Jan. 13, 1949, a total of 123 g. being given in three months. The patient's clinical improvement was remarkable (cf. figs. 1a and b): the residual sinus healed by Oct. 22 and remained so; the lumbar abscess similarly disappeared; his temperature remained normal; his E.S.R. fell; and his weight rose (see fig. 2).

After the streptomycin had been stopped, the patient's condition was assessed before his discharge. His weight was then 136 lb. and E.S.R. 4 mm. in the first hour (Westergren); a radiogram of his chest was normal; a blood-count showed Hb 106%, red cells 4,880,000 per c.mm., white cells 9000 per c.mm. (polymorphs 50%). His urine was normal. A Congo-red test on Jan. 11 showed no evidence of amyloid disease, 75% of the dye being retained in the blood after 60 minutes as opposed to 44% on Sept. 8, 1948. The liver-function tests showed a remarkable change:

Total plasma-protein 7·5 g. per 100 ml.
Serum-albumin 6 g., serum-globulin 1·5 g. per 100 ml.
Albumin/globulin ratio 4·0 : 1.
Alkaline phosphatase 9 units.
Thymol turbidity 6 units.
Thymol flocculation +.
Colloidal gold negative.

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The thymol-flocculation test now alone suggested slight abnormality.

The patient was discharged on Jan. 21 with his disease arrested, and arrangements were made for his future attendances, but he moved to the north of England. In April, 1949, he wrote to say he was well, his sinuses were still healed, and he had maintained his weight, which was 147 lb. in his clothes.

Case 2.—A male research chemist, aged 33, had for two years been working with imported ground hoof and horn meal obtained from cattle and believed to be sterilised before entering the country. In November, 1948, he had seven days' diarrhœa and vomiting but passed no blood or mucus, and after this he felt unwell and very tired. There was some generalised lower abdominal aching pain, relieved by defæcation. By December the patient had lost 10 lb. in weight, the pain persisted, and one day he had severe tenesmus, followed by the passage rectally of first pus and then a clear discharge. On examination shortly after this no abnormal physical signs were found, and rectal examination revealed only slight induration. Over Christmas there were attacks of colicky lower abdominal pain, with tenderness in the left iliac fossa. The patient was admitted to hospital on Jan. 5, 1949, and after this an abdominal tumour developed rising out of the pelvis.

At laparotomy on Jan. 18 a pelvic abscess was found, and from the pus *Actinomyces israelii* was grown. At this time the patient was pale and ill, with a discharging sinus in the left loin and a tumour in the left iliac fossa which reached to half way between the symphysis pubis and the umbilicus. There was no fever, and his weight was 112 lb. (normal said to be 133 lb.) The E.S.R. was 26 mm. in the first hour (Westergren). A blood-count showed Hb 99%, and white cells 13,800 per c.mm. (polymorphs 78%, lymphocytes 20%). Radiographs of chest, lumbar spine, and barium enema were all normal.

Treatment.—On Jan. 31 streptomycin alone was started, 2 g. being given daily for the first four weeks, then 1 g. daily for a further eight weeks, making a total of 112 g. in twelve weeks (0·5 g. four times a day for four weeks, 0·25 g. four times a day for four weeks, and 0·5 g. twice daily for four weeks).

Progress.—By Feb. 25 the sinus had healed and the patient felt well. The tumour steadily became smaller and by March 10 was impalpable. The patient's E.S.R. fell from a maximum of 42 mm. on starting the streptomycin to below 10 mm. five weeks later and has remained below this figure, while his weight increased an average of 2 lb. weekly, reaching 146 lb., and has remained at this level since. During the last four weeks the streptomycin was given to him as an outpatient, the whole course finishing on April 18. At this time he had no symptoms; the sinus was still healed, and no abscess was palpable. Arrangements were made for him to attend regularly as an outpatient.

Case 3.—A woman, aged 53, noted lassitude and loss of weight in March, 1948; in August she had a stiff neck, and a swelling developed near the angle of the jaw on the right side. On Sept. 7 she was admitted to the West Middlesex Hospital. She was then pale and ill, had a low-grade pyrexia and weighed 67 lb. (normally 80 lb.); she had bad teeth, and a cold fluctuant tumour was present behind the angle of the right jaw. No other abnormality was found.

The abscess was incised on Sept. 10 and thick gelatinous creamy pus obtained, but no organisms were seen or grown either aerobically or anaerobically. A blood-count on Sept. 8 showed anæmia and leucocytosis: Hb 68%, red cells 3,470,000 per c.mm., white cells 23,400 per c.mm. (polymorphs 93%). Blood-culture was sterile, and a Wassermann reaction and Kahn's test were negative. Radiographs of the chest showed two well-defined consolidated areas in the right apical region, and in the lower lobe a cavity (later proved by tomography) which was thought to be a lung abscess. Bronchoscopy was normal.

Treatment and Progress.—Penicillin was given four-hourly for four weeks from Sept. 10 to Oct. 9, to a total of 21·4 mega units (200,000 units four-hourly for the first three weeks, and then 100,000 units four-hourly). The patient improved, and on Oct. 1 radiography showed that the lung abscess had disappeared; the weight was steady, and the leucocytosis had decreased, the white cells on Oct. 18 numbering 10,800 per c.mm. (polymorphs 85%). On Oct. 16 a dental clearance was done under a penicillin shield.

She was discharged on Oct. 22 symptom-free, apyrexial, weighing 68 lb., and with an E.S.R. of 32 mm. in an hour (Westergren), and a discharging sinus still present below the right jaw. She was seen as an outpatient and at first she improved, gaining weight to 72 lb., and the sinus in the neck healed.

In January, 1949, she again felt ill, she was losing weight, and a swelling formed behind the angle of the left jaw. Stiffness of the neck again developed, with severe pain on movement and tenderness over the cervical vertebræ. The patient was readmitted to hospital, and the swelling was incised on Feb. 21; the pus contained *Actinomyces israelii* in pure culture. Radiography of the cervical spine on Feb. 24 showed osteomyelitis (narrowing of the joint space between the 4th and 5th cervical vertebræ, with a small area of bone destruction in the anterior superior part of the body of the 5th cervical vertebra). Between Feb. 21 and March 3 penicillin 100,000 units four-hourly was given to a total of 6 mega units; it was then stopped.

After the end of the penicillin course the patient was thin (weight 64 lb.), ill, pale, and edentulous, with no sinus in the gums. The pain, tenderness, and stiffness of the neck persisted. The E.S.R. was 35 mm. in the first hour (Westergren); radiograms of the jaw and chest were normal, and that of the spine showed osteomyelitis of the 5th cervical vertebra. A blood-count showed Hb 71%, red cells 4,900,000 per c.mm., white cells 10,000 per c.mm. (polymorphs 81%). A Congo-red test showed 45% absorption of the dye in the first hour; there was no albuminuria. The diagnosis was actinomycosis of the cervical glands, actinomycotic osteomyelitis of the 5th cervical vertebra, and a possible previous actinomycotic lung abscess. A small degree of amyloid disease may have been present.

Streptomycin 0·5 g. four times a day (2 g. daily) was given from March 4. After a week the patient felt better, and in a fortnight movement of the neck was no longer painful and there was only slight limitation of flexion, all other movements being full. Her weight increased to 67 lb. and her E.S.R. fell, being after the fourth week of treatment below 10 mm. at each weekly reading; by the third week all the sinuses had healed. After four weeks the dose of streptomycin was reduced to 0·25 g. four times a day (1 g. daily) and continued at this dose for a further four weeks. In the seventh week an eosinophilia developed, there being 29% of eosinophils in a total white-cell count of 6400 per c.mm., but clinical improvement continued. At the end of the eighth week the dose of streptomycin was again halved, 0·25 g. being given twice daily (0·5 g. a day) for the last four weeks, the last injection being given on May 28, 1949, after a total dosage of 98 g. in twelve weeks. Clinically the patient was then much improved, all the sinuses were healed and there was no tenderness or stiffness of the neck. She weighed 72 lb., having gained only 8 lb. in all—a less dramatic increase in weight than in cases 1 and 2, but this might be because she was only half the size of these patients and also because she was edentulous and so had considerable difficulty in eating a solid diet. A blood-count on June 9 showed, red cells 5,100,100 per c.mm., Hb 14·8 g. per 100 ml. (101%), white cells 10,100 per c.mm. (polymorphs 64%, lymphocytes 28%, monocytes 6%, eosinophils 2%), and X-ray films of the cervical spine showed no evidence of active disease. The Congo-red test on June 1 showed that only 20% of the dye was absorbed. At the moment it appears that the disease is arrested but a further period of observation has been arranged.

DISCUSSION

Though we realise that none of these three cases can yet be considered as cured, it is clear that streptomycin had a powerful effect on the actinomycosis.

That streptomycin alone can arrest actinomycosis is shown by case 2. The patient had a progressive illness with a rapidly enlarging abdominal abscess. Streptomycin alone was used in treatment, and the patient quickly improved, the sinus healing and the abscess vanishing.

Cases 1 and 3 show that streptomycin may arrest actinomycosis when penicillin, sulphonamide, and potassium iodide have failed. Both cases had a grave prognosis; in case 1 many organs were involved, and in case 2 there was osteomyelitis of a vertebra. Both patients

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had had adequate treatment with other therapeutic agents and both had relapsed.

The course of streptomycin used in these three cases lasted for three months: 2 g. was given intramuscularly daily in four divided doses for the first month, and 1 g. daily for the second month in four doses a day in all three cases. In the last month cases 1 and 2 received streptomycin 1 g. daily, case 1 in four equal doses, and case 2, who was treated as an outpatient, two doses of 0·5 g. Case 3 was given only 0·5 g. daily for the last month in two divided doses, because she weighed only half as much as either of the first two patients. No side-effects were seen from the streptomycin except for eosinophilia in the seventh week in case 3, and local pain at the site of injection, which was relieved with procaine.

The optimal dose and course of streptomycin are not known but those used were chosen for the following reasons. A heavy initial dose was given to avoid the risk of the organism's becoming insensitive. This was continued for four weeks and then reduced to half to lessen the risk of intolerance. Because relapses are notorious in actinomycosis (cf. case 1) the course was continued for three months. The correct dose and length of the course can only be discovered by greater knowledge of streptomycin and by the treatment and continued observation of many further cases of actinomycosis. Potassium iodide and streptomycin may possibly be synergistic, as suggested by the work of Woody and Avery [3] in their experiments on tuberculosis in guinea-pigs; but, until much more is known, we feel that it would be most unwise to give a shorter course than three months.

The assessment of progress in so chronic a disease as actinomycosis is difficult, but in our three cases there was obvious clinical improvement as early as the second week. The patients both appeared better and said they had a sense of well-being which they had not enjoyed for many months. The healing of the sinuses and the disappearance of the abscess took longer, but the amount of discharge from the former and the size of the latter decreased rapidly.

Weekly charts of weight and E.S.R. are of the greatest assistance in following the course of actinomycosis. The E.S.R., which was measured by Westergren's technique, seems to be a finer index of the activity of actinomycosis than is the temperature, as was shown in case 2, where the E.S.R. was raised but the temperature was normal throughout, though a large abscess was present.

SUMMARY

Three cases of actinomycosis are described, of which two were severe.

Treatment with streptomycin caused improvement and arrest or cure of the actinomycosis in all three cases.

The optimal dosage of streptomycin is not yet known, but the results in these three cases indicate that the course should last three months. The dose for patients of average weight should be 2 g. daily for the first four weeks and then 1 g. daily to a total of twelve weeks. The streptomycin should be given in four divided doses daily for the first two months and may be given twice daily in the last four weeks if improvement is adequate.

Weekly weight and E.S.R. charts are useful in assessing improvement.

Our thanks are due to Mr. W. J. Ferguson for transferring case 2 to our care; Dr. N. F. Coghill and Mr. J. Scholefield for case 3; and Dr. P. Chippindale for suggesting the use of streptomycin in the first place and for carrying out the routine treatment when this was decided.

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INTESTINAL ACTINOMYCOSIS TREATED WITH STREPTOMYCIN

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INFECTION of the intestine by actinomyces is not uncommon, but we have not found any published report of a case treated with streptomycin either parenterally or by mouth. A very satisfactory clinical and radiological response to streptomycin by mouth was obtained in the following case.

A male Jew, aged 32, first seen in March, 1946, gave three months' history of indefinite abdominal pain with discomfort after food and had noticed tenderness in the right iliac fossa. His motions were looser than normal.

He looked pale and had lost some weight. Palpation of his abdomen revealed a tumour about 3 × 1½ in. in the right iliac fossa. It was firm and irregular, slightly mobile from side to side, dull to percussion, and tender on deep pressure only. The rest of the examination was negative. Blood-count: 3,800,000 red cells per c.mm.; Hb 76%; 12,000 white cells per c.mm. (polymorphs 80%, lymphocytes 8%, monocytes 11%, eosinophils 1%). Radiologist's report on a barium meal: "The stomach and duodenum were normal, and there was normal passage of the barium to the lower ileum. The mucosal pattern of the terminal ileum was distorted. The ileocæcal valve could not be visualised and there was a constant filling defect and deformity of the cæcum and ascending colon."

Carcinoma of the cæcum was diagnosed, and after preparation with succinyl sulphathiazole, a laparotomy was performed. The mass in the right iliac fossa was found to consist of about the last 10 in. of the ileum and the cæcum, which were thickened and matted together. There were some enlarged ileocæcal glands, and the loop of small intestine immediately proximal to the mass was lightly adherent to it and also thickened, especially on the mesenteric border. Nothing abnormal was detected elsewhere in the abdomen. The lower 2½ ft. of the ileum, with the cæcum, ascending colon, and hepatic flexure, with as much mesentery as possible, were resected in one piece. The cut ends of the ileum and transverse colon were closed, and a side-to-side anastomosis was performed. The bare area on the posterior abdominal wall was reperitonised and the abdomen closed. Pathological report (Dr. C. V. Harrison): "Macroscopically there is a thickening of the mucosa of the ileum and cæcum with small abscesses in the mesenteric glands. Sections show a purulent infiltration in both gut and mesentery, with a branching mycelium. I think we can safely regard this as a case of actinomycosis."

Penicillin and iodides were given as soon as this report was received, and the patient progressed satisfactorily. He returned home on April 25, 1946, with instructions to continue with iodides by mouth. Three months later he was readmitted with a fluctuant swelling just above the right iliac crest. This discharged, and coliform bacilli were grown from the pus; no mycelial filaments were identified at this time. The patient was again given large doses of penicillin and iodides and left hospital, with the abscess healed, on Aug. 5.

The patient next reported in October, 1948, with six weeks' history of weakness, frequent small watery motions, and a constant desire to go to stool. He had lost 12 lb. in the previous two months. He was certain he had passed no blood or mucus in appreciable amounts. His operation wounds had healed, but a sausage-shaped mass 2½ × 1½ in. was felt in the right side of the abdomen just medial to the right anterior superior iliac spine. This mass was not tender and was only slightly mobile from side to side. The rectal mucosa felt thick and leathery and extended in prominent longitudinal ridges from the anus into the rectum as far as the finger could reach. Hb 76%; white-cell count 11,000 per c.mm. (polymorphs 73%). The report on a barium meal given on Oct. 27 was: "There was normal passage of the meal to the lower ileum. At this level the ileum was dilated and contained gas. Distal to this part it became a narrow tube which ascended from the pelvis to the

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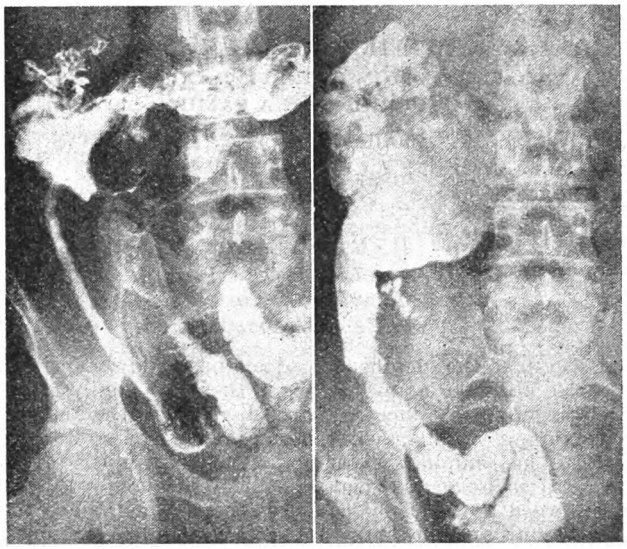
ileo-transverse colostomy (fig. 1). The site of this narrow piece of intestine corresponded to the mass that could be palpated in the right iliac fossa. This appearance of the bowel is not unusual for a short time after an ileo-transverse colostomy, but its presence so long after operation, its constant outline, and the association with the mass in this region suggest infiltration of the wall of the intestine such as would result from either Crohn's disease or actinomycosis. The distortion of the transverse colon at the anastomosis may be due to adhesions or infiltration of the wall of the gut."

At sigmoidoscopy on Nov. 2 no actual ulceration of the rectum was seen, but the mucosa was pale, very œdematous, and covered by a thin layer of salmon-pink pus. Just above the pelvirectal junction the mucosa appeared normal though pale, and no mucopus was seen here.

A small abscess subsequently appeared on the anterior aspect of the anus. This was incised, and the pus contained gram-positive mycelial filaments and sulphur granules. Anaerobic culture grew typical colonies of *Actinomyces bovis*. Similar gram-positive filaments were identified in the mucopus obtained from the rectum. Frei's test proved negative. Penicillin in large doses, iodides, and sulphonamides caused no improvement.

Streptomycin Therapy.—From Dec. 1 streptomycin 0·5 g. was given by mouth twice daily for thirty days. Within a few days there was well-marked clinical and symptomatic improvement. On Dec. 9 sigmoidoscopy showed the upper part of the rectum to be clear of disease; the lower part was as before but with less inflammatory changes. Sigmoidoscopy three weeks later showed no sign of active inflammation, though the walls of the anal canal were still rather rigid and the longitudinal ridging was still just palpable. The swelling in the right iliac fossa had completely disappeared. When 30 g. of streptomycin had been given, the treatment was stopped; no untoward effects were noted.

By the end of January, 1949, the patient had put on 15 lb., his bowels were now opening only once a day, the ridging of the rectum had almost disappeared, and the abscess at the anus had healed. A barium-meal radiogram on Jan. 24 (fig. 2) showed the stomach and duodenum to be apparently normal, and the barium passed quickly to the terminal ileum, which ascended from the pelvis to join the transverse colon in the right hypochondrium. This section of ileum had increased in calibre since the previous examination, was mobile on screening, and was neither palpable nor tender. The calibre of the transverse colon at the anastomosis had increased, and on screening the wall of the colon was mobile and flexible.



(1) (2)

Fig. 1—Barium-meal radiogram showing pipe-like segment of lower ileum and distended proximal loops of small bowel.

Fig. 2—Barium-meal radiogram showing increased calibre of lower ileum after streptomycin therapy.

DISCUSSION

We have found only three published reports of the treatment of actinomycosis with streptomycin: Costigan (1947) cured an infection of the mandible by intramuscular injections; Jacobson and Cloward (1948) used streptomycin intrathecally and intramuscularly in association with penicillin and sulphonamides in the successful treatment of a case of meningeal actinomycosis; and Pulaski and Seeley (1948) temporarily improved an infection of the respiratory tract with the drug.

On many occasions, however, streptomycin has been given both by mouth and parenterally in different intestinal infections with equivocal results. Kirschner (1946) records spectacular improvement after intramuscular injections in a patient with acute fulminating colitis. Seligmann et al. (1947), giving streptomycin 25–100 mg. by mouth three-hourly, suppressed the growth of *S. typhi-murium* in children. On the other hand, Pulaski and Amspacher (1947) obtained disappointing results in typhoid fever and poor results in acute and chronic brucellosis.

Nevertheless, provided streptomycin can be brought into contact, in sufficient concentration, with all foci of infection, it seems reasonable to suppose that organisms sensitive to the antibiotic would be inhibited and the chance of successful treatment enhanced.

The rationale for giving streptomycin by mouth depends on the fact that it is not inactivated by the gastric or intestinal contents and is absorbed, if at all, in only very small amounts from the intestine (Anderson and Jewell 1945). Heilman et al. (1945) showed that no streptomycin could be demonstrated in the blood-serum after oral doses of 500,000 units. When streptomycin is given parenterally, the quantity found in the stools is extremely small, and Keefer et al. (1946) thought that this probably entered the bowel in the bile.

As regards dosage, Pulaski and Amspacher (1947) found 0·01–0·02 g. of streptomycin per g. of fæces after it had been given by mouth in doses of 4 g. a day, and that this concentration rapidly eliminated gram-negative bacteria from the stools. Kane and Foley (1947), giving streptomycin 1 g. by mouth daily found that coliform bacilli were eliminated from the fæces in two days, and Keefer et al. (1946) reported that all streptomycin-sensitive organisms in the bowel were greatly reduced in numbers after streptomycin had been given by mouth. In a series of sensitivity tests Keefer and his colleagues demonstrated that, in vitro, some strains of *Actinomyces bovis* were inhibited by a concentration of 3·75 µg. of streptomycin per ml., but they recommended that, in dealing with any organism, a concentration of the drug 4–8 times that needed in vitro would probably be required, since in vivo the sensitivity of the organism is often altered by the presence of serum and blood.

In our case a strain obviously sensitive to streptomycin was present, but there are probably many strains which are resistant to streptomycin. The successful result seems to justify the use of streptomycin in intestinal actinomycosis. Streptomycin given by mouth, however, may not reach some foci of infection, and it would therefore be wise to give the antibiotic parenterally at the same time.

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RETINITIS PIGMENTOSA ASSOCIATED WITH CYSTINURIA

TWO UNCOMMON INHERITED CONDITIONS OCCURRING IN A FAMILY

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MUCH of the significance of an observed association of two inherited abnormalities in the same family group lies in the assistance the record gives to the task of "mapping" human chromosomes. As Fraser Roberts (1945) has emphasised, it is particularly important to report such an association when the abnormalities concerned are each infrequently encountered, since the opportunity to do so may not recur in the field of human genetics for centuries.

Retinitis pigmentosa, though uncommon, is not rare as hereditary disorders go, and most cases are not associated with other defects except perhaps cataract, which may be regarded as part of the disease. Of its associations the more frequent are deafness and deaf-mutism (Bell 1922), but these cases form special syndromes due to one particular abnormal gene. Retinitis pigmentosa and cystinuria have not, so far as we have been able to discover, been reported as occurring together in the same patient and family. The opportunity to study such a case arose recently; and, though the turmoil of war had disrupted the family here considered, enough information has been obtained to permit certain conclusions to be drawn as regards the inheritance of these disorders.

CASE-RECORD

An unmarried Jewess, aged 40, was admitted to St. Mary's Hospital in March, 1948, complaining of pain, frequency of micturition, and failing vision.

On analysis her pains were various. Epigastric pain had been present intermittently for fourteen years and was fully characteristic of duodenal ulcer. The duration of the bouts of this pain had been greater than usual during the past year. In addition, a dull ache in the lumbar region had plagued her for thirteen years. It was made worse if she remained still in one position but eased somewhat with moderate exercise. In the last eighteen months there had been added an aching pain in the occipital and cervical regions, also relieved by movement. She had also occasionally experienced shooting pains down the outside of the legs to the ankles, though these at first only affected the left leg.

Micturition was frequent and for the last four years had occurred approximately hourly during the day and three or four times at night. The symptom was worse in cold weather but had never been associated with dysuria or hæmaturia.

The patient's eyesight had been poor when she attended school at the age of 6 years, and she was then said to be short-sighted. Night-blindness had been noticed since early childhood, and retinitis pigmentosa was diagnosed when she was 19. For the past thirteen years she had been conscious of increasing limitation of her peripheral visual fields and of dimming of central vision. Her reading was restricted to print the size of newspaper-headlines.

Personal History.—The patient was born of a French Jewish mother and an Austrian father. She was intelligent and well educated and since coming to England in 1939 had earned her living by teaching languages. She had had measles in childhood.

Physical Examination.—An obese Jewess with sallow Slavonic features. As regards her ailments, she combined an intelligent insight with anxiety concerning her prognosis. The cardiovascular, respiratory, alimentary, and hæmopoietic systems showed no significant abnormality. The kidneys were not palpable; nor was there tenderness in the renal angles. The urine was acid and contained cystine crystals on repeated examinations, but casts, albumin, and sugar were absent. The central nervous system was normal apart from the findings in the eyes; the pupils were regular and dilated, with impaired reaction to light and accommodation. We are indebted to Mr. F. A. Williamson-Noble for the following ophthalmoscopic report: "Vitreous opacities are present in both eyes. The discs are waxy and pale, and the arteries much reduced in calibre. Some scattered "bone corpuscule" pigmentation is seen in the periphery, together with widespread atrophy of the retinal pigment layer. The pigment masses are less in amount than usually found in retinitis pigmentosa, but the condition is not *sine pigmento*."

Investigations.—Barium-meal radiography disclosed an active duodenal ulcer. Radiography of the urinary tract did not show radio-opaque stones. By contrast urography, however, the details of the middle group of calyces on the left side could not be demonstrated. Retrograde pyelography was recommended but was refused by the patient. Radiography of the lumbar spine and sacro-iliac joints showed early osteo-arthritic changes only. Several catheter specimens of urine showed a few pus cells, but significant organisms were absent and cultures sterile.

Course.—The symptoms of duodenal ulcer improved with treatment by rest, diet, and alkalis, and repeated radiography showed the ulcer to have healed after some six weeks. The lumbar and occipital pains were eased by local heat and massage. The frequency of micturition continued, being uninfluenced by altering the reaction of the urine. There was no perceptible change in the visual defects during the period of observation.

The patient had duodenal ulcer, retinitis pigmentosa, and cystinuria. The evidence for a renal calculus was equivocal, frequency of micturition being the only symptom with certainty directly attributable to the urinary system. The lumbar and occipital pains were considered to be musculo-skeletal in origin.

THE PATIENT'S FAMILY

The patient's parents were distantly related, being third (or fourth ?) cousins (fig. 1).

The mother (II7) was the youngest of 7 sisters, all of whom, so far as is known, were normal. She died of cancer at the age of 67. She was examined specifically for retinitis pigmentosa and cystinuria, and neither condition was present.

The father (II8) had a younger sister and two younger brothers, the two brothers having five children each; all in this group were, so far as is known, normal. The father died at the age of 37, the cause of death being unknown; he was never examined specifically for retinitis pigmentosa or cystinuria, but is remembered as having had very good eyesight.

The sibship (III1–6) of which the patient is the third child is the only abnormal one.

III1.—The eldest brother, aged 45, has neither cystinuria nor retinitis pigmentosa. He has two daughters (IV1 and 2), now in their second decade, who have been examined and so far have shown no signs of abnormality.

III2.—This brother, aged 43, has both cystinuria and retinitis pigmentosa. The cystinuria was discovered when he had an attack of renal colic at the age of 40. Retinitis pigmentosa presented with a history of his being short-sighted since childhood. There has been increasing visual defect since the age of 53.

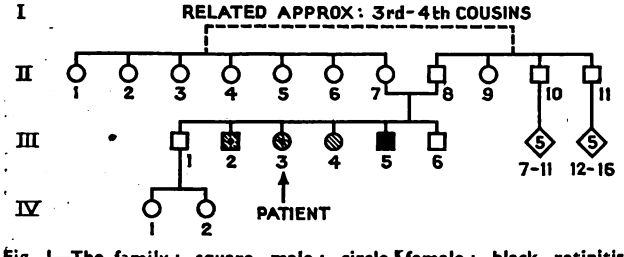

Fig. 1—The family: square, male; circle, female; black, retinitis pigmentosa; hatched, cystinuria; hatched with black dot, retinitis pigmentosa and cystinuria.

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III3.—The patient, described above, is the only member of the family known to have had symptoms of duodenal ulcer.

III4.—The sister, aged 39, has cystinuria with no visual disturbance. The cystinuria was diagnosed when she was 25, when she had an attack of severe abdominal pain, for which appendicectomy was performed. The pain was not relieved, and soon after the operation she passed two cystine stones. Her renal symptoms continued, and she has had a nephrectomy.

III5.—This brother, aged 26 in 1939, has been missing since the occupation of Poland. He was known to have retinitis pigmentosa but was not examined for cystinuria.

III6.—This brother, aged 24 in 1940, was lost in France during the war. So far as is known, he was normal, and he was accepted as fit for service in the French Army.

FIG. 2

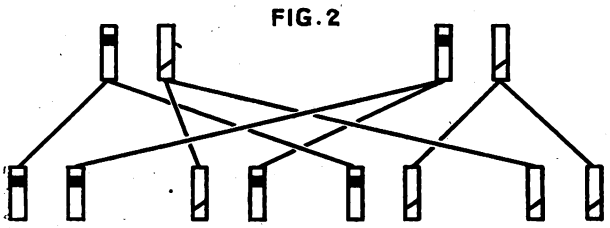


FIG. 3

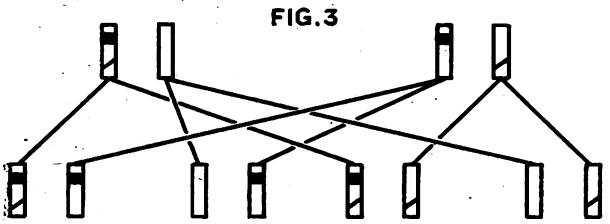


FIG. 4

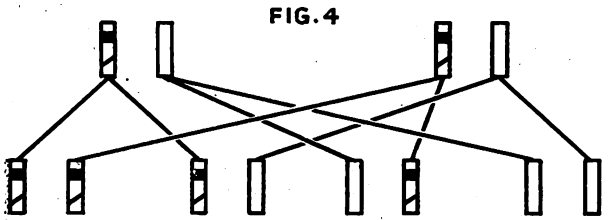


FIG. 5

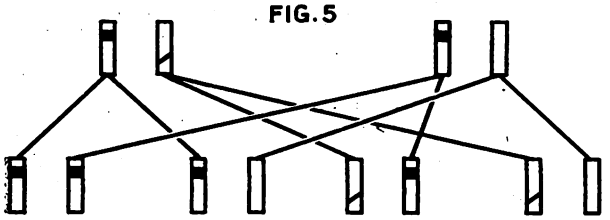
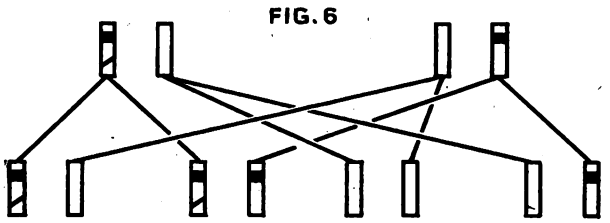


FIG. 6



Figs. 2–6—Possible linkages of retinitis pigmentosa (black bar) and cystinuria (oblique line): fig. 2, genes in repulsion in both parents; fig. 3, genes in repulsion in one parent and in coupling in the other; fig. 4, genes in coupling in both parents; fig. 5, genes in repulsion in one parent, while the other parent carries only retinitis pigmentosa; fig. 6, genes in coupling in one parent, while the other parent carries only retinitis pigmentosa.

DISCUSSION

Retinitis pigmentosa may be dominant, sex-linked, or recessive in transmission (Allan 1937), and there is evidence that sporadic cases may occur also. Most cases, however, are due to a recessive gene, and this is doubtless true of the present family, as is shown by the familial incidence, the relationship of the parents, the absence of a history of blindness in earlier generations, and the fact that both sexes are affected.

The type of inheritance of the cystinuria is more difficult to determine. Both dominant and probable recessive inheritance have been described (Aberhalden 1903, Macklin 1934). Lewis (1932) has found cystinuria with a frequency of 1 in 585 of 10,000 students examined, and in none of these cases were there any symptoms. The relation of Lewis's high frequency of minor degrees of cystinuria to the gross and rare disease is, however, uncertain. Nevertheless, unlike retinitis pigmentosa, cystinuria cannot be excluded on the above history alone in the case of the father (II8), who is dead. The mother (II7) was known to have been unaffected. Dominant inheritance, perhaps irregular, must therefore be considered as an unlikely possibility in this case.

The value of observations on the simultaneous occurrence in the same family of different inherited defects is that a very small pedigree may be sufficient to rule out close linkage; or, if close linkage does exist, a somewhat larger pedigree may provide good evidence of the fact (Roberts 1945). In any individual instance the likelihood of finding that two given genes are situated on the same chromosome pair is not great, because in the human somatic nucleus there are 23 pairs other than the sex chromosomes.

The evidence from this pedigree justifies consideration of the possibility of linkage of the retinitis pigmentosa and cystinuria. Two hypotheses may be considered: (1) retinitis pigmentosa and cystinuria are both recessive; and (2) retinitis is recessive and cystinuria is dominant. The various possibilities are illustrated in figs. 2–6.

If retinitis pigmentosa and cystinuria are both recessive and the genes are linked, they could be situated either on the same chromosome (coupling) or on opposite chromosomes (repulsion). If the genes are in repulsion in either or both parents (figs. 2 and 3), the offspring, apart from crossing over between the chromosomes, could include only those with one abnormality or the other, or with neither; but in this sibship III2 and the patient combine both abnormalities, which would imply two certain cross-overs if this hypothesis were correct. If the genes are in coupling in both parents (fig. 4), the offspring, apart from crossing over, could include only those with both abnormalities or with neither, which would in this sibship imply one certain and one probable cross-over (III4 and III5).

Thus, if cystinuria can be accepted as recessive in this pedigree, the family history, small as it is, suffices to make the hypothesis of close linkage distinctly unlikely.

There remains, however, the possibility that cystinuria is dominant; if so, the evidence is not quite so clear. If there were linkage, and if the parent with cystinuria carried the gene on the opposite chromosome to that bearing the gene for retinitis pigmentosa (fig. 5), the offspring, apart from cross-overs, could only have one condition or the other, or neither; there would thus be two cross-overs (III2 and III3), and the hypothesis of close linkage is rejected as decisively as before. But, if the genes in the cystinuric parent were in coupling (fig. 6), the non cross-over offspring could have both conditions, cystinuria alone, or neither abnormality.

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Thus, only if III5 is accepted as being free from cystinuria, does the sibship show a cross-over.

SUMMARY

A case of retinitis pigmentosa associated with cystinuria is reported. The family history is described.

The retinitis pigmentosa in this case and probably the cystinuria are autosomal recessive characters.

The gene for cystinuria is probably located on a different chromosome pair from that of retinitis pigmentosa.

We are indebted to Dr. J. A. Fraser Roberts for his kind interest and helpful criticism.

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TREATMENT OF HAY-FEVER
BY INJECTION OF NASAL MUCOSA WITH ALCOHOL

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THE rhinological treatment of hay-fever usually aims at suppression, or at least depression, of the extreme ticklishness of the nasal mucosa during the pollen season, and has included ionisation, cauterisation, and the topical application of anti-histamine drugs or of antigen.

Ionisation undoubtedly relieves symptoms in some cases but in others it has proved disappointing. Cauterisation also is open to criticism, in that, if the cautery is used lightly, the relief is not likely to be of long duration; if deeply, there is a risk of lasting local damage to the mucosa, and even a small area of dead tissue may offer a breeding-ground for infection. The local or general use of anti-histamine drugs appears to be soundly based, but these drugs cannot be expected to achieve progressive improvement. General immunisation with antigens requires long courses of injections, and some patients lack the necessary persistence. Local administration of antigen is on trial and has seemed promising in young subjects.

For the last twenty years I have preferred to treat pollen allergy by a method which depends on the fact that the mucosa in nasal allergy is not equally sensitive throughout its extent. Except in rare instances the greater part of the visible mucosa does not seem to be concerned in responding to allergens; there are usually small well-defined patches which are always on guard, even to some degree in winter, and their exquisite ticklishness can be benumbed by the injection into them of alcohol.

The idea of desensitising the nasal mucosa by injections of alcohol dates back many years. I first heard of it from an American colleague during the 1914–18 war and first used it in 1921. Leichsenring [1] in 1931 described a method and obtained many successful results for periods lasting from one to three seasons. Walsh [2] in 1932 described the result of injecting the sphenopalatine ganglion with alcohol; the method does not commend itself as innocuous. Vail [3] in 1933 recorded some successes by injecting up to 4 ml. of 40% alcohol "into" the inferior turbinate and the septal mucosa but made no mention of two points which I emphasise: the importance of accurately mapping out the areas of extreme sensibility, and the necessity of keeping the injection intramucosal.

1. Leichsenring. *Z. Hals-, Nas.-u. Ohrenheilk.* 1931, **28**, 220.
2. Walsh, T. E. *Arch. Otolaryng., Chicago*, 1932, **16**, 83.
3. Vail, H. H. *Ibid*, 1933, **18**, 651.

RATIONALE

If the nasal passages are widely opened up by spraying with neosynephrin 0·25% or other suitable vasoconstrictor, and the nasal lining is touched gently with a probe, it will be found that, though palpation for the most part produces the usual mildly unpleasant sensation, there are small areas the touching of which produces an unbearable tickling, with watering of the eye, even before the pollen season has arrived. The distribution of these trigger areas does not follow that of the chronic œdematous thickenings and polypi which occur with nasal allergy; they have been, in all the cases examined, on a level inferior to these, which were first pointed out by Zuckerkandl.[4]

The nasal symptoms of hay-fever can all be diminished, sometimes completely relieved, by obliterating tactile sensation in these patches, which may occur in any part of the nasal passages but are most commonly found on the septum, the lower border being about 1 in. upwards and backwards from the mucocutaneous junction. On the septum they are sometimes pale and slightly raised above the surrounding mucosal surface. Another common site is the anterior third of the inferior turbinate, about $^1/_4$ in. above its lower margin and sometimes extending forwards to the edge of the narial skin.

In one man, aged 50, sensitive to the Chinese primula, the only trigger was on the dorsum of the soft palate on the left side.

In another unusual case the sensitive area was on the floor of the nasal passage about $^1/_2$ in. from the nostril.

In another, ticklishness was confined to a raised area of septal mucosa on the left side about 2 mm. in diameter. This patient, a violinist, was unable to play in one particular concert-hall; she did not sneeze there, but felt quite prostrated, and her distress was thought to be psychogenic; obliteration of sensation of this trigger with alcohol enabled her to play in the hall, to the dust of which she was doubtless allergic.

Help in delimiting the trigger area is afforded by spraying the nose with adrenaline; after a few minutes, when the rest of the mucosa has blanched, the offending spots are often rendered visible by the fact that they remain red. It is essential that the whole of each sensitive patch be treated.

METHOD

The instruments, &c., required are a laryngeal mirror, a nasal speculum, a Heath's probe, nasal forceps, a fine spray, an all-metal dental syringe with a fine 3-in. needle, $^1/_2$ in. ribbon gauze, 70% alcohol, and a solution of cocaine hydrochloride 20% with equal parts adrenaline hydrochloride 1 in 1000. A bright light is essential.

The patient is seen preferably a week or more before he expects to begin sneezing, and the existence of inflammatory trouble in the sinuses and teeth is first excluded.

One nasal passage is lightly sprayed with the solution of cocaine and adrenaline, and the sensitive patches are anæsthetised by packing against them some ribbon gauze moistened with the same solution for, say, 15 minutes.

The needle is then introduced into the mucosa (not through it) at the postero-inferior border of the trigger area, and a tiny drop of alcohol is introduced by firm slow pressure. The injection produces a small area of blanching and usually occasions pain, which rapidly disappears; the next drop is introduced $^1/_4$ in. forward and upward from the first, and so till the mapped out spot has been covered. On the septum, intramucosal injection is relatively simple; but on the inferior turbinate it is very easy to push the needle right through the mucosa and waste the alcohol on the erectile tissue.

4. Zuckerkandl, E. Normale und pathologische Anatomie der Nasenhöhle und ihrer pneumatischen Anhänge. Vienna: vol. I, 1882; vol. II, 1893.

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Within an hour or two of injection the nasal passage is usually occluded by swelling of the mucosa, the obstruction being increased by a plastic exudate from the area injected. It is therefore undesirable to inject both sides of the nose at once. About four days later it is usually possible to free the nasal passage for breathing by removal of the plastic exudate; after this the opposite side may be treated.

If the patient is seen after the pollen season has begun, it will be less easy to anæsthetise the offending areas, and injection may cause bleeding. Successful results have sometimes been obtained even at the height of the season, but I prefer at such a time to avoid injection and to paint the trigger areas with undiluted chromic acid. Relief may be so obtained and sometimes persists for several weeks.

RESULTS

Alcohol has been injected, usually with benefit, in more than 100 patients, aged 7–50 years. Two of the earlier patients, treated in 1928, have been free from hay-fever ever since; but they are exceptional. Both of these were over 40, and the injection perhaps served long enough for them to reach an age at which they would in any case have become immune.

The result as a rule is to reduce symptoms below the threshold of distress, and often to obliterate them for at least one season. In such a case it may be found a year later that the injected areas are still insensitive, but that a crescentic area at the periphery may have become sensitive—a condition easy to treat with a small further injection.

Sequelæ

There seems to be very little unavoidable risk in this treatment. Two cases were met with early in the series in which the needle transgressed the mucoperichondrium of the septum, and the injection produced a small cartilaginous slough, over which the mucosa was replaced by scar tissue, without impairing the result.

In one early case of pollen allergy with chronic ethmoiditis the treatment was followed by pyrexia and malaise for some days. Cases have been selected more critically since.

There would be a risk of producing anosmia if a case were treated in which the trigger area was high up on the septum; in fact no high area has been met with, either on the septum or the middle turbinate.

Bleeding from the needle-punctures, usually slight at the outset, may be a nuisance after the vasoconstrictor has worn off, and it may be associated with a bout of sneezing.

Disappointments

Immediate relief from sneezing and eye-watering is the rule. One female patient, early in the series, experienced no benefit whatever; probably in this case inflammation had not been excluded, or there were other areas than those treated. In 4 other cases immediate temporary relief lasted only three or four weeks.

In several cases the sensitive areas were, at the outset, small but required five or six injections before sensitivity to the probe was everywhere obliterated. The impression gained was that the ticklish area had increased, during the period of observation, with the flowering of later plants; it is certainly more difficult to map out the affected areas in the winter than when the pollen-season has begun. It might be possible to render them evident by spraying with a pollen solution.

Similar sensitive spots may be found on the palpebral conjunctiva; the rhinologist has no concern with these, but it might be possible to devise a suitable treatment for them. Meanwhile in many cases potassium chloride gr. 5 four-hourly may relieve the eye symptoms.

In a very few instances there has been a response resembling an attack of hay-fever, which has lasted several days. In one such case the patient, after treatment of one side, declined to attend for the remaining side to be done; but her mother wrote some months later saying that she had had no colds since the injection on one side (the more sensitive is always chosen first). Previously she had had an incredible number of what she called colds—probably dust allergy.

Another patient, a medical colleague, had complete relief from pollen allergy for three seasons after one side had been treated, though both sides had appeared to be equally sensitive.

In one case only was the disappearance recorded of many small ethmoidal polypi at an inspection three months after the treatment.

DISCUSSION

Whatever the tissue change at the sensitive spots, it is found that, if they can be rendered insensitive to touch, the symptoms of pollen allergy are relieved. It may be supposed that the alcohol acts by paralysing the terminal branches and nerve-endings, with the result that news of the arrival of the allergen is prevented from reaching the brain or the rest of the mucosa, for rhinorrhœa ceases when the patch is anæsthetised with alcohol. The effects should not be expected to last more than two or three years, judging from experience in nerve injections elsewhere; it is therefore difficult to explain the fact of the complete relief which lasted in two cases for over twenty years. Inspection of the nose was recently possible in one of these cases, and it was found that the mucosa was still insensitive to touch in the regions treated; there was also a faint suggestion of scarring. It is recognised that alcohol produces scar tissue—witness the difficulty of a second injection of the gasserian ganglion—but it is much less than that resulting from ionisation or cautery.

It seems that trigger areas operate in the case of other inhalants also, for one or two cases of dust and horse allergy have been satisfactorily treated in the same way. In one child, aged $4^1/_2$ years, who was treated under general anæsthesia, the asthma was completely arrested, and in one or two cases of asthma in adults the symptoms have been somewhat relieved.

In very few cases of pollen allergy was the whole of the nasal mucosa characteristically sensitive to touch, and only one of these, a man aged 55, was treated (under general anæsthesia). A modified success was achieved in this case, in that he was able to stay in England for the summer instead of going to a place abroad where he was surrounded by sea on three sides; but he was by no means symptom-free.

One man, aged 35, recently treated, warned me that he would faint if the interior of his nose was touched, and made as if to do so after two or three minims of alcohol had been injected on the right side. He was restored by the exhibition of $^1/_2$ oz. of neat whisky, after which the treatment was completed on that side. At the next visit, whisky being in short supply, $^1/_2$ oz. of neat gin was given before the treatment of the left side was begun, and no faintness was experienced. (In any future patient who is likely to faint the tongue will be painted with mustard, which is said to be equally effective and would certainly be more economical.)

SUMMARY

In nasal allergy the sensitivity to inhalants appears to be vested in relatively small areas of mucosa, which may in most cases be injected with 70% alcohol under local anæsthesia, in the expectation of immediate complete or partial relief from symptoms for one season—sometimes for several seasons.

Contra-indications are the presence of inflammation in the teeth or sinuses, and the (rare) existence of characteristic sensitivity over most of the nasal mucosa.

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DIPHTHERIA PROPHYLAXIS IN VERY YOUNG INFANTS

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EARLY in 1948, in ignorance of work which had been going on in Stockholm and at the Wellcome Physiological Research Laboratories at Beckenham,[1] I began an investigation designed to prove or disprove the theory, which had long been in vogue, that diphtheria prophylaxis is unsatisfactory during the earlier months of life.

Vahlquist [2] records some highly interesting experimental work on newborn and very young infants, based on blood-antitoxin titrations. In the case of the newborn infants these titrations were presumably made on cord blood; but in infants aged 2–8 months Vahlquist must have facilities for bleeding children in Sweden which would be hard to come by in this country in routine clinic work. The conclusions he reached which are relevant to the present discussion were briefly as follows:

(1) In countries where the natural immunity of the population against diphtheria is low, newborn infants lack antibodies against diphtheria.

(2) Such circumstances favour the undertaking of active immunisation against diphtheria at a very early age. The reason for this is that Vahlquist found that, when the passively acquired antitoxin of the infant was equal to 0·1 (or more) unit per ml., the effect of injected diphtheria toxoid was apparently inhibited. When the blood-antitoxin was below 0·02 unit per ml. there did not appear to be any inhibition.

(3) Active immunisation of the newborn infant is feasible; and, though the production of antibodies is often retarded in these very young infants, the titre *finally* achieved is satisfactory.

The work now to be described is, of necessity, based on the Schick standard. The starting-point was the fact that, as a result of many years' experience in this country, I had noted that practically every child at 12 months of age gave a positive primary Schick test. If, therefore, a procedure could be found which rendered nearly all children Schick-negative at the end of the first year of life, it could fairly be assumed that active immunity to diphtheria had been successfully bestowed.

METHOD

The coöperation of parents had to be obtained, and it was explained to them that it was hoped that we could provide an immunity against whooping-cough, and possibly also against diphtheria, even when dealing with infants as young as 3 months of age.

The material used was Parke, Davis & Co.'s combined diphtheria and whooping-cough prophylactic, the diphtheria antigen being Holt's P.T.A.P. The Lf content of the combined material was 25 units per ml.

The infants treated were aged 3–5 months. All injections were given by the deep intramuscular route into the deltoid muscle and the prophylactic was administered by three different methods:

Group A received 1 ml. of the combined prophylactic—i.e., 25 Lf units of toxoid. A month later an injection of pure pertussis vaccine (1 ml. of P.D. & Co. material) was given, followed by a similar pertussis injection after a further month. Thus the above procedure constituted a single-injection prophylaxis as regards diphtheria.

Group B were given two injections of 0·5 ml.—i.e., 2 × 12·5 Lf—of combined prophylactic, in opposite arms, at a month's interval, followed by 1 ml. of pure pertussis vaccine a month after the second injection.

Group C received the same dosage and materials as group B, but both the combined injections were given in the same arm, to find out whether the result was inferior to that obtained from using opposite arms.

RESULTS

It was found that almost every child treated by any of the three methods gave a negative Schick test at the age of a year. There is a slight amount of evidence that a total of 25 Lf units is best administered as two doses of 12·5 Lf units at a month's interval rather than as a single dose of 25 Lf, but the figures are too limited for any firm conclusion to be drawn from them. The results are set out in the table.

GROUP A

(Single injection of 25 Lf units of P.T.A.P.)

AGE (MOS.)	NO. OF CASES	POST-SCHICK AT 1 YR. POSITIVE	NEGATIVE
3	21	1	20
4	13	2	11
5	12	0	12
Totals	46	3	43

Schick-negative rate at age of 1 yr. = 93·5%.

GROUP B

(Two 12·5 Lf doses in opposite arms, at 1 month interval)

3	15	0	15
4	11	0	11
5	4	0	4
Totals	30	0	30

Schick-negative rate at age of 1 yr. = 100%.

GROUP C

(Two 12·5 Lf doses in same arm at 1 month interval)

2	1	0	1
3	8	0	8
4	7	0	7
5	5	0	5
Totals	21	0	21

Schick-negative rate at age of 1 yr. = 100%.

Taking all three groups together there were 97 children, of whom 3 were post-Schick positive and 94 negative, giving a Schick-negative rate at the age of 1 year of 96·9%.

Local reactions after injection of the combined prophylactic were usually trifling or absent. The occasional rather brisker reactions appeared to be associated more with the pertussis vaccine than with the diphtheria antigen.

There has been no case of diphtheria in any of the inoculated infants up to now; and, in spite of the fact that several of the children were known to have been exposed to whooping-cough subsequent to inoculation, no recognisable case of this disease occurred among them. One child did develop whooping-cough shortly after it had received its first injection of pertussis vaccine, but the complete course had not been given, and no protection could have been anticipated. Thus up to the present (when many of the infants are over the age of 18 months), so far as we can possibly tell, the record of the fully inoculated is clear as regards both diseases.

DISCUSSION

The criticism may be raised that the number of cases is small. More were done originally but removals whittle down the cases somewhat, and it is not easy to obtain the coöperation of large numbers of trusting parents who possess children of just the right ages. In view of the present interest in this matter, it is perhaps advisable not to postpone the publication of the evidence for the sake of adding a few more cases.

The most interesting point as regards diphtheria is the fact that so many infants were rendered Schick-negative at an interval of 7–9 months after a single injection of 25 Lf units of toxoid, given as P.T.A.P. The

1. Parish, H. J., Barr, M., Glenny, A. T., Randall, K. J. Communication to the Royal Society of Medicine on April 4, 1949.
2. Vahlquist, B. *Lancet*, Jan. 1, p. 16.

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primary stimulus alone appeared to be almost adequate. It may be found necessary to give a boosting dose at the end of the first or second year, but the present series is not being given boosts; the children will be retested at the age of 2 years, so that the durability of the immunity can be demonstrated.

CONCLUSIONS

It is apparently quite feasible and safe to immunise infants against diphtheria at the age of 3 months (perhaps even earlier) under the conditions of herd immunity now prevailing in and around London. Of all the children treated in the foregoing investigation, 96·9% have proved to be Schick-negative at the age of a year. Insufficient maternally bestowed antitoxin remained in the blood of practically all the infants to interfere with the development of active immunity. Proof of the durability of the protection must await the results of further Schick-testing of the children when they are 2 years old.

One great advantage of immunisation at a very early age is that the infant has not yet developed the sense of fear, and, apart from an occasional brief cry, does not object to the injections, so the procedure is attended by little disturbance to the mother, the child, or, last but not least, the doctor. At 3 months the infant is only just about large enough to deal with properly, and, in view of the observations of Vahlquist [2] and of the Wellcome Physiological Research Laboratories, it does not seem likely that much would be gained by undertaking prophylaxis before this age.

If, in future, immunisation is done at the end of the third month, it might be well to dispense entirely with giving prophylactic injections to the mother during pregnancy. Any antitoxin passed on to the infant as a result of that procedure may only retard the establishment of active immunity when treatment is undertaken at the age of 3 months.

If a mother has been immunised before the birth of her baby, it seems advisable that the baby should receive two immunising injections, one at the 3rd and one at the 9th month. The first injection would give a primary stimulus at 3 months to all infants with little or no circulating antitoxin. The second injection at 9 months, would provide a stimulus to infants who did not respond to the first injection owing to the swamping effect of the maternally bestowed antitoxin on the antigen injected. The age of 9 months has been suggested for the second injection, since practically all infants have lost any appreciable amount of antitoxin from the maternal source by this time and have become Schick-positive.

The work here described may have some value as confirmation, under practical working conditions, of the observations of other investigators mentioned.

Such scanty evidence as there is seems to suggest that P.D. & Co. vaccine may be effective in preventing whooping-cough, at any rate in recognisable form, in young infants.

Thanks are due to Dr. James Fenton, medical officer of health for Kensington, and Dr. Harry Smith, divisional medical officer of No. 1 (London) Division, for facilities in connexion with this investigation; and to Miss E. M. Law, health visitor, of Kensington, for much help in arranging attendances and keeping records.

"... Most people are accustomed to think of the arrangement by which wives, and children up to the period of adolescence, are normally dependent on the earnings of the male head of the family as though it were one of immemorial antiquity, almost inseparable from the existence of the family as a social unit. Yet in fact, at least in its present extent and as concerning the manual workers, it is a quite modern arrangement."—ELEANOR RATHBONE, *Disinherited Families*. New edition, London: 1949.

Reviews of Books

Measurements of the Public Health

F. A. E. CREW, M.D., D.SC., F.R.S., professor of public health and social medicine, University of Edinburgh. Edinburgh: Oliver and Boyd. 1948. Pp. 243. 18*s*.

THE texts for Professor Crew's new essays on social medicine are taken from the 1945 report of the Registrar-General for Scotland, but he makes comparisons with other countries and draws lessons from their experience. Opening with a lucid description of modern population trends, he discusses the medicosocial problems created by an ageing population, and the implications of a positive population policy. Then follows an account of illegitimacy and its hazards, which is informed with humanity and good sense. These chapters, with the one on marriage and divorce, provide the type of equipment in elementary social biology to which every medical student is entitled. Without it none should enter general practice, but even today many curricula cannot find room for it. In another essay Professor Crew expounds his well-known views on the perils of being a male animal. Among the newly conceived the ratio of male to female is probably very high; but among the liveborn it is barely 105 : 100, and by the time the centenarians are counted it is down to 25 : 100. Two chapters on mortality are detailed and highly instructive when dealing with reproduction and infancy, but otherwise sketchy, which is a pity when there is growing recognition of the need to integrate social and clinical medicine. One day, we hope, Professor Crew will give us a fuller discussion of the problems to which all branches of medicine are deeply committed, and to which, it must be said, the Registrars-General devote most of their space; for example, the increasing mortality from coronary disease and cancer of the bronchus and the changing rates for peptic ulcer and diabetes. Where there are already so many good things it is perhaps ungracious to ask for more, but many would have appreciated an essay, which Professor Crew is so well qualified to provide, on the extent to which a report such as the Scottish Registrar-General's for 1945 does in fact measure the public health as we now conceive it.

British Surgical Practice

Vol. V. Editors: Sir ERNEST ROCK CARLING, F.R.C.S., F.R.C.P., consulting surgeon, Westminster Hospital; Sir JAMES PATERSON ROSS, M.S., F.R.C.S., director of surgical clinical unit, St. Bartholomew's Hospital, and professor of surgery in the University of London. London: Butterworth. 1948. Pp. 494. 60*s*.

VOLUME V contains 39 sections, starting with Hodgkin's disease and ending with lymphogranuloma inguinale. Diseases of the intestine, of the joints, and of the kidney occupy a considerable part of the book. The standard of its predecessors is maintained by vol. V; but it is nevertheless refreshing to find, amid a wealth of practical detail, chapters of such general interest as those on hormones (Dr. Peter Bishop) and on inflammation (Prof. G. R. Cameron, F.R.S.). Dr. W. M. Levitt's section on the law in relation to surgery is absorbing. The more one sees of this work, the better it seems. The small complaint in our review of vol. IV was perhaps ungracious; for only superlative editing could have evoked so good a performance from so many pens.

La physiologie post-traumatique de l'articulation

Dr. THEO MARTI, Privat-docent en médecine des accidents à la faculté de médecine de l'Université de Genève. Basle: Schwabe. 1948. Pp. 77. Sw. fr. 5.

THIS little monograph covers much of its ground in great detail. The histology and pathology of joint trauma are described both as regards the normal joint and joints already diseased. Dr. Marti has obviously been impressed by Leriche's works, and while denying their wholehearted acceptance he elaborates and uses their principles for other conditions, such as joint fractures and Duplay's disease. So much space is given to detailed pathology that little is left for clinical examples, or other evidence of its accuracy. Only one brief chapter, so compressed as to be of little practical value, deals

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with treatment. Those who agree with Leriche will find the book interesting; unfortunately it will do nothing to convert the unbeliever. One feels that it should be longer. But is the request for a second helping prompted by the delectability of the porridge or its thinness?

Skin Diseases in General Practice

F. RAY BETTLEY, M.D., F.R.C.P., physician for diseases of the skin, Middlesex Hospital, London. London: Eyre & Spottiswoode for the *Practitioner*. 1949. Pp. 260. 21*s*.

THIS practical handbook should be of real service. Dr. Bettley has indicated the most up-to-date treatment for those cases of skin disease which can suitably be dealt with by doctors in their surgeries, where, in these days of overcrowded outpatient clinics, more of this work will have to be undertaken. Dermatological clinics are likely soon to become mainly diagnostic centres, and hospital treatment will be provided only for those patients who require elaborate or dangerous methods of therapy. The practitioner is well able to deal adequately with the commoner types of skin disease, especially after any doubt about the diagnosis has been cleared up by a hospital consultation. This book will help him with both diagnosis and treatment. The illustrations are first-rate and the text is concise; and the book has the additional merit of being a small one.

Modern Trends in Psychological Medicine

Editor: NOEL G. HARRIS, M.D., F.R.C.P., D.P.M. London: Butterworth. 1948. Pp. 450. 50*s*.

THIS is not a scrupulously documented reference work, but a series of more or less personal statements of the present position in some eighteen fields of psychiatric study and practice. The level of authority and competence varies rather widely. There are two American contributors, John Whitehorn and Jules Masserman (the latter writes, rather surprisingly, on psychological medicine and world affairs); not all the writers are psychiatrists—thus Samson Wright deals with physiology of emotions, E. F. Griffith with marriage and family life, and H. R. Hamley with character formation in relation to education. Though several of the contributors are evidently much influenced by psycho-analysis, there is no chapter specifically devoted to this, nor does it appear in the index—surely a serious omission. The book is readable and informative, rather than scholarly or incisive.

Lawson Tait

J. HARVEY FLACK, M.D. London: Heinemann Medical Books. 1949. Pp. 137. 17*s*. 6*d*.

Dr. Harvey Flack has undertaken a difficult if not invidious task in this memoir of Lawson Tait, around whom so much controversy has centred. He does not attempt to extenuate the many weaknesses of Tait's character, but he clearly points to the virtues of this extraordinary man, and makes it evident that he was one of the pioneers of gynæcological surgery in this country in much the same way as Péan was in France. His defects in more general matters were many and hard to excuse: his contempt for Listerism—as he called it—was outspoken and ill-advised, and his bitterness against experiments on animals alienated him from many of his own profession. But he played a great part in his own chosen work. The little book is a sympathetic study of a remarkable character, full of contradictions.

La lobectomie supérieure

A. MAURER; R. H. SWEET; J. MATHEY; HENRI LE BRIGAND; F. TOBÉ, Fils. Paris: Vigot. 1948. Pp. 71.

THIS short work on excision of the upper lobe of the lung affords good opportunity to correlate surgical anatomy with the actual operation. It is divided into three sections, written by different authors. The first describes the hilus of the upper lobe, noting particularly the variations in distribution of the pulmonary artery. The second is devoted to the actual technique of lobectomy, in which the individual elements of the pedicle are separately secured. The difficulties commonly encountered are thoroughly discussed—e.g., pleural adhesions, enlarged glands, and imperfections in the interlobar fissures. In the final section Richard Sweet, of Boston, analyses 63 cases of upper-lobe excision. The results show a mortality of 8%; in another 11% there were complications severe enough to require further major surgery. The remaining patients recovered satisfactorily. The complications are described in detail and make valuable reading for those interested in the subject.

This monograph is written for the specialist, to whom its ample detail will be useful.

Pathology and Surgery of Thyroid Disease

JOSEPH L. DE COURCY, M.D., senior surgeon, Good Samaritan Hospital, Cincinnati; CORNELIUS B. DE COURCY, M.D., member of the surgical staff, De Courcy Clinic, Cincinnati. Springfield, Ill.: Charles C. Thomas. Oxford: Blackwell Scientific Publications. 1949. Pp. 476. 50*s*.

THE De Courcys, of De Courcy Clinic, are the well-known Cincinnati exponents of thyroidectomy. Their skill in the art of exposition is somewhat less evident. The arrangement of their book is haphazard, and in places eccentric, as exemplified by a section on blood-pressure in myxœdema neatly embedded in a chapter on the preoperative preparation of the thyrotoxic patient. Though all important topics are discussed at some length, it is often difficult to discover whether the opinions expressed are the authors' or somebody else's. They seem to regard all the symptoms of thyrotoxicosis (except the raised metabolic rate) as due to irritability of the sympathetic nervous system. Nevertheless they recommend subtotal thyroidectomy as the best treatment, though after operation the patient must take thyroid extract for a year and must avoid fatigue and worry. Another interesting section describes the use of serum-iodine estimations as an index of liver function—an idea which must surely be the authors' own. This book could be regarded as a useful collection of information about thyroid disease and its treatment, if no more straightforward accounts (such as Crile's) were available.

Traitment Moderne des Brulures (Paris: Vigot. 1948. Pp. 62.).—In this booklet Prof. Jacques Virénque and Dr. Jean Secail describe their treatment of burns, which is not very dissimilar to that used in this country. Emergency measures, they hold, should be limited to the treatment of shock, and they deprecate any application to the burned area other than a sterile dressing. The patient should be moved early to a special unit, where he is taken to the theatre and cleaned in a saline bath, plasma being given as required. Mercurochrome, boric acid, and weak penicillin are applied, under compression dressings, and the whole area is encased in plaster. After operation blood-transfusion will probably be required, even if there is hæmoconcentration. The blood chemistry is closely studied. Penicillin is given, and in late cases antitetanic serum; the affected parts are elevated; and the plaster is removed on the 20th day. Grafting is used where needed. The latter part of the book describes repair of deformities, with examples.

Textbook of Medicine (9th ed. Edinburgh: E. & S. Livingstone. 1949. Pp. 875. 30*s*.).—"Conybeare" has already become a warm favourite with both students and practitioners. This ninth edition shows little change from its predecessors. It still compresses into less than a thousand pages all the essentials of medicine, though it has conscripted the insides of both the front and back covers to bring in the tables of equivalent weights and measures and the normal figures for various laboratory and biochemical tests. Thus it is literally (to use this abused word) filled from cover to cover with information. As with all such textbooks designed to summarise knowledge in easily accessible form, the editor's main difficulty must almost always be to decide what to leave out. Sir John Conybeare has wisely omitted some of the new forms of treatment which may be still in an experimental stage and has concentrated on the practical aspects of disease as met with in practice—and in the examination room. Of the special sections, the chapters on psychological medicine and diseases of the skin are particularly good, and Mr. R. C. Brock has written a new and concise account of empyema. A number of other articles have been revised or rewritten, and Prof. Richard Ellis has undertaken the section on diseases of infants in place of Dr. Maitland-Jones. The price, compared with that of many books of lesser stature, is remarkably low.

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THE LANCET

LONDON: SATURDAY, JUNE 25, 1949

Part-time Teachers

ONE effect of paying doctors on the staffs of teaching hospitals is to formalise their relation with the governing bodies; an easy-going understanding is being replaced by a system of contracts. At the same time the motive for seeking a place on the staff is changing. Formerly specialists, in giving their services gratis, could rely on an indirect return from private patients referred by practitioners whom they got to know through their hospital duties; and those on the establishment of a teaching centre were content to teach undergraduates for nothing, or for a small honorarium, in the knowledge that these students, once established in practice, would tend to call on their former instructors when they wanted a consultant's opinion. It was a curiously haphazard system; but it worked, and on the whole it worked happily. In future these hospital appointments will be sought for the different reason that with private practice on the wane the hospital is the chief source of income. As regards teaching, however, no new motive has replaced the old; and some authorities, notably in the London schools, are afraid that the new contracts and payments will not ensure a satisfactory relation between the staff of a teaching hospital and its associated medical school.

The Ministry of Health has laid it down that specialists shall be paid at the same rates whether they are employed at teaching or non-teaching centres; their salaries will come from the board of governors or the regional hospital board as the case may be. The fear in some minds is that the board of governors, though it includes representatives of the medical schools, may fail in its duty to provide for suitable clinical teaching. Many members of these boards have come fresh to the problems of a teaching hospital; moreover, the attitude of a governing body to teaching may change if financial stringency continues. As things stand, the University Grants Committee are proposing to pay part-time teachers on a very small scale in view of the remuneration which they will receive from the Ministry of Health through the governing body of the hospital. Some schools, we learn, are approaching boards with the request that teaching duties shall be included in the terms of contracts; but they are not satisfied that this will suffice. Why, after all, should a doctor choose to work at a teaching hospital, where he has to undertake many tasks outside his set duties and hours, when with much less strain on himself he can earn as much at a non-teaching centre? The Spens Committee [1] doubted "whether it will be possible to secure the best men for teaching unless they receive higher total remuneration." The University Grants Committee, however, is believed to have suggested extra payment totalling only some one to two hundred pounds a year, including all lectures; and clearly this is insufficient. The opposing argument, voiced mostly by the provincial universities which depend to a greater extent on full-time teachers, is that if the part-time teacher's payment were increased much beyond this sum he might earn from hospital and school as much as the full-time professor, thus disturbing the balance; but close examination does not seem to justify this impression, for most of the part-time teachers, at least in London, seem to be engaged for only 4–5 sessions per week. What is certain is that the present arrangement provides no assurance that as the present generation passes the staff will continue to teach; nor does it acknowledge the importance of teaching, or take into account the vast amount of work of other kinds hitherto normally done for the school by the staff of the hospital on which it is based. Much the same concern is expressed in respect of registrars. Schools that previously contributed as much as half the cost of paying registrars are now to pay nothing; the whole cost is to be found by the hospital, which may at any time reduce their number on grounds of economy, or transfer them from the more general departments, where they are most needed for undergraduate teaching, to highly specialised departments where they would be less useful to the school.

Not all schools share this anxiety. Some are willing to forgo the services of registrars as medical tutors, and plan the replacement of part-time by full-time clinical teachers. Those resisting this development, however, point out that clinical tutorship has been a useful step towards a senior post, during which the tutor has gained little less than the tutored; and that the part-time teacher has helped the student by providing on the whole a rather more general outlook than his whole-time colleague, who tends to develop very special interests. Be this as it may, the schools that believe that the part-time teacher can contribute something valuable should be sure of obtaining his services.

The momentum of the old system will not run down for a decade or so. But would it not be wise to make sure of starting a new momentum now?

1. Report of the Interdepartmental Committee on the Remuneration of Consultants and Specialists. Cmd. 7420. H.M. Stationery Office. 1948.

Non-suppurative Encephalitis in Britain

BEFORE ECONOMO described epidemic (lethargic) encephalitis in 1916 non-suppurative encephalitis was rarely considered in the differential diagnosis of diseases of the central nervous system. Apart from rabies, the encephalitic changes of neurosyphilis, and those accompanying tuberculous meningitis, only the encephalitic form of poliomyelitis (Heine-Medin's disease), Strümpell's hæmorrhagic encephalitis, and Wernicke's polioencephalitis hæmorrhagica superior were recognised. Wernicke's "encephalitis," which mainly affects alcoholics but has also been described in pernicious anæmia, hyperemesis gravidarum, and gastric cancer, is now known to be not an inflammatory disease of the brain but a deficiency syndrome, due to lack of thiamine and probably other nutritional factors. The world-wide spread of epidemic encephalitis after the first world war led to a unitarian theory of the ætiology. Not only were sporadic cases of non-suppurative encephalitis with a variety of clinical

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symptoms accepted as lethargic encephalitis, but the encephalitis following vaccination, rabies immunisation, measles, or rubella was also thought to result from activation of the unknown virus of lethargic encephalitis. The failure to differentiate the various forms of encephalitis was mainly due to the difficulty of interpreting the neurohistological findings. There are only a limited number of ways in which the nervous system can react to a noxious agent. Neurones show degeneration which may go on to necrosis whether the lesions are the result of an infection, of vascular changes, or of a heredo-degenerative condition. Wherever large numbers of myelin sheaths undergo degeneration fatty material is liberated and microglia mobilised to form accumulations of compound granular cells. In a chronic process there will be astrocytic proliferation and replacement of nerve tissue by glial scars. Cellular infiltration of the adventitial spaces, so conspicuous in lethargic encephalitis, is found not only in practically all forms of virus encephalitis but also in meningococcal and tuberculous meningitis. The type of cells—whether polymorphs or histiocytes, lymphocytes or plasma cells—indicates the rapidity of the pathological process rather than its nature. Similarly, penetration of the perivascular infiltrates beyond the glial membrana limitans is evidence of a severe process and not a specific reaction. Thus as a rule the type of encephalitis present cannot be diagnosed from the pathological findings alone. In the last few years, however, thanks to collaboration between clinician, neurohistologist, virus specialist, and experimental pathologist, more than 20 different viruses causing encephalitis have been identified, and some correlation has been established between the distribution, main location, severity, and character of the lesions and the resulting clinical symptoms on the one hand and the type of virus or other noxious agent on the other.

Most examples of non-suppurative encephalitis are virus diseases, and an important guide in the pathological diagnosis is what SMITH[1] calls "intrinsic cellular susceptibility." Viruses are strictly intracellular parasites, and a virus will only penetrate a cell whose enzyme system and surface structure are suitable for the particular virus structure. Hence viruses may be pantropic, dermotropic, or neurotropic, and they also show a special affinity for groups of cells, such as certain cerebral nuclei. This affinity is determined not only by the type of virus but also by the cellular metabolism of the host, which depends on his age, nutritional state, and so on. Thus in children the varicella-zoster virus is dermotropic and the complicating encephalitis is characterised by a perivascular myelinoclasis, probably allergic; whereas in adults this virus acts on the spinal ganglia and their homologues in cranial nerves, and the rare cases of zoster encephalitis show hæmorrhagic and necrotising lesions resembling those in equine encephalitis. Studies of the distribution of lesions and the cytological details, together with animal experiments, have clarified the long-disputed relation between Economo's encephalitis and the virus of herpes simplex, which was at one time thought to be the causative organism. Herpes simplex encephalitis is now known to be a different disease. It has an acute onset with fever, headache, and vomiting, rapidly followed by twitching, convulsions, spastic or flaccid paralysis, and coma.[2] At necropsy the brain is soft, and the lesions, mainly located in the cerebral cortex, consist of areas of softening with accumulations of "Gitter cells," perivascular cuffing, and hæmorrhages. In the nerve cells and neuroglia of affected areas intranuclear inclusion bodies known as Cowdry's type A are found. These are eosinophil, spherical or oval bodies, which are at first granular and then homogeneous, and are surrounded by a clear ring owing to withdrawal of the chromatin to the nuclear membrane —a phenomenon known as margination. This type of inclusion body occurs in the skin lesions of herpes simplex, where it is known as a Lipschütz body, and also in zoster and yellow fever. Another form of encephalitis with rather similar neurohistological findings, but in which the herpes virus has not been isolated from the central nervous system, is DAWSON'S[3] "inclusion encephalitis," mainly confined to children. This has an insidious onset, with weakness of limbs and unsteadiness of gait, and runs a progressive course with ultimately signs of total decortication. BRAIN et al.[4] described 4 examples in England and at least one unpublished case has been studied.[5] A quite distinct condition, also mainly affecting children, was described by van BOGAERT[6] as "leuco-encéphalite sclerosante subaigue." Here there is a severe and rapid psychical disintegration with aphasia, agnosia, and apraxia, epileptiform seizures, and torsion spasm, leading to decerebrate rigidity with opisthotonos and progressive cachexia. The lesions are mainly found in the subcortical white matter; inclusion bodies are not seen in the nerve-cells; and in contrast to the heterogeneous group of diseases known as diffuse subcortical sclerosis, demyelination is not an essential feature of the condition. A case in a girl of 6 years has been described in this country.[7]

While virus research and detailed pathological investigation have thus differentiated a series of forms of encephalitis as distinct from Economo's encephalitis, animal experiment has added to our knowledge of postinfective and idiopathic disseminated encephalomyelitis. This form of encephalitis was first observed after vaccination for smallpox. Twenty years ago its frequency in England was estimated at 1 in 48,000 vaccinations[8]; some countries seem to escape it altogether, and in Holland, where the frequency has been as high as 1 in 4000 vaccinations,[9] the complication is common in some areas and rare or absent in others. Its incidence bears no relation to the type of vaccine used; it is rare after revaccination, and very rare in infancy. In a few cases the vaccinia virus has been isolated from the cerebrospinal fluid and post-mortem material,[10] but most attempts to find it have failed. The same is true of measles encephalitis.[11]

1. Smith, W. *Proc. R. Soc. Med.* 1949, **42**, 11.

2. Smith, M. G., Lennett, E. H., Reames, H. R. *Amer. J. Path.* 1941, **17**, 55. Whitman, L., Wall, M. J., Warren, J. *J. Amer. med. Ass.* 1946, **131**, 1408.
3. Dawson, J. R. *Arch. Neurol. Psychiat.* 1934, **31**, 685.
4. Brain, W. R., Greenfield, J. G., Russell, D. S. *Brain*, 1948, **71**, 365.
5. Baar, H. S. Unpublished.
6. Bogaert, L. van. *J. Neurol. Psychiat.* 1945, **8**, 101.
7. Rosanoff, W. R. *Ibid*, 1947, **10**, 61.
8. Report of Committee on Vaccination, Ministry of Health, London, 1928.
9. Greenberg, M., Appelbaum, E. *Amer. J. med. Sci.* 1948, **216**, 565.
10. Eckstein, A. *Ergebn. inn. Med. Kinderheilk.* 1929, **36**, 494.
11. Schaffer, M. F., Rake, G., Hodes, H. L. *Amer. J. Dis. Child.* 1942, **64**, 815.

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The symptoms of postvaccinal encephalomyelitis usually appear 10–12 days after vaccination, and the clinical picture may resemble acute meningitis, or may be dominated by convulsions, or may present as a brain-stem syndrome with tremors, twitching, and somnolence or finally as a myelitic syndrome resembling poliomyelitis. The pathology differs from that of most known forms of virus encephalitis, but is identical with that of the encephalitic complications of rabies immunisation, measles, chickenpox, mumps, and rubella, and with some cases of scarlet fever encephalitis. The lesions mainly consist of multiple perivascular areas of demyelinisation in the white matter of the brain and spinal cord, but there is also a lymphocytic infiltration of the walls of the blood-vessels in the cerebral cortex which is said to be the most constant and earliest change.[12] In the past few years American workers [13] have produced a very similar disease in monkeys and guineapigs by immunising them with homologous or heterologous brain tissue, liquid paraffin and heat-killed tubercle bacilli being used as adjuvants. JERVIS [14] has reported that guineapigs with such an allergic encephalitis always have anti-brain antibodies in their serum, and these have also been demonstrated in some cases of encephalitis following rabies immunisation, though not in disseminated sclerosis. This suggests that post-infective and possibly "idiopathic" encephalomyelitis may be an auto-immunisation effect; but it does not explain the local variations in the frequency of postvaccinal encephalomyelitis, and GREENFIELD'S [15] view that these variations are the result of activation of an endemic virus cannot yet be discarded.

It must be realised that not all cases of encephalopathy following infections are due to disseminated encephalomyelitis. Thus the frequent cerebral complications of whooping-cough may result from cerebral hæmorrhage, thrombosis of dural sinuses, or an encephalitis with degenerative changes in the cortical neurones,[16] in which air embolism may play a part. In scarlet fever, embolism or hæmorrhage is sometimes responsible for cerebral symptoms. In the encephalitis accompanying pneumonia [17] the essential feature is thrombosis of cerebral vessels, and severer cases show perivascular ring-and-ball hæmorrhages with leucocytic infiltration and areas of demyelination. The findings are identical in all types of pneumonia, including atypical or virus pneumonia, and NORAN and colleagues [18] ascribe the cerebral changes to some factor liberated from the lungs and interfering with the clotting mechanism, a view for which they have experimental support.

Much confusion still exists with regard to the hæmorrhagic encephalopathies. The separation of Wernicke's type has been mentioned. Septic hæmorrhagic encephalitis, usually associated with thrombosis of the superior longitudinal sinus and/or purulent meningitis, is not uncommon in the newborn. Multiple petechiæ in the brain may be due to thrombocytopenic purpura or leukæmia, and in the newborn subependymal petechiæ are usually the result of asphyxia. The "brain purpura" described by SCHMIDT [19] and characterised by ring hæmorrhages is found in arsenical encephalopathy, uræmia, pernicious anæmia, and burns. The acute hæmorrhagic leuco-encephalitis of HURST,[20] reported in this country by HENSON and RUSSELL,[21] is probably closely related to the conditions described by BAKER [22] in the U.S.A. and by MARGULIS and others [23] in Russia. This has an acute onset, with rapid loss of cerebral functions, headache, and vomiting. The pathological changes are almost entirely confined to the cerebral white matter, and the essential lesion is severe damage to the blood-vessels. The Russians have isolated from their cases a virus which was pathogenic for mice and rabbits. They claim that this virus, or a closely related group of similar viruses, is responsible for human disseminated encephalitis and also for disseminated sclerosis, and that patients with these diseases have improved after treatment with formolised brain from animals which had succumbed to the infection. This work has not yet been confirmed. It remains to be decided whether disseminated perivascular myelinoclasis with involvement of the spinal cord, hæmorrhagic leuco-encephalitis affecting mainly the cerebral white matter, and disseminated sclerosis are variants of the same disease or different ones, and whether they are due to viruses or to auto-immunisation.

The People and the Family

IN the days when our people numbered round about a steady 7 million, they must have had a pleasant sense of elbow-room. The sevenfold rise which brought the population of Great Britain to its present 49 million has only been achieved during the past two hundred and fifty years. According to the Royal Commission on Population, appointed in 1944, which has now reported,[24] the increase has been due to the steady fall in death-rates associated with the growth of medical knowledge, and advances in sanitation and standards of living. Fine families, especially in the Victorian age, were not only born but survived; and thanks to their tenacious hold on life Great Britain became strong and rich, engaged widely in commerce, and built a great colonial Empire. It is always tempting to say that one cannot have too much of a good thing; and there are those who see no remedy for the present declining trend of the birth-rate other than a return to the pullulating oyster-bed (as GEORGE ORWELL has called it) of Victorian family life. We are, in fact, fortunate to have escaped salvation on those lines; for, as the commission point out, if the nineteenth-century rate had been maintained the population would reach 130 million in A.D. 2000, and 460 million by 2100—a growth which would inevitably

12. Appelbaum, E., Dolgopol, V. D., Dolgin, J. *Ibid*, 1949, **77**, 25.
13. Rivers, T. M., Sprunt, D. H., Berry, G. P. *J. exp. Med.* 1933, **58**, 39. Kabat, E. A., Wolf, A., Bezer, A. E. *Science*, 1946, **104**, 362. *J. Neuropath. exp. Neurol.* 1947, **6**, 333. *J. exp. Med.* 1947, **85**, 117. Ferraro, A., Jervis, G. A. *Arch. Neurol. Psychiat.* 1940, **43**, 195.
14. Jervis, G. A. *J. Neuropath. exp. Neurol.* 1949, **8**, 117.
15. Greenfield, J. G. *Brain*, 1929, **52**, 171.
16. Spatz, H. *Nervenartz.* 1931, **4**, 466.
17. Noran, H. H., Baker, A. B. *Amer. J. Path.* 1946, **22**, 579.
18. Noran, H. H. *J. Neuropath. exp. Neurol.* 1947, **6**, 206. Noran, H. H., Baker, A. B., Larson, W. P. *Arch. Neurol. Psychiat.* 1947, **58**, 653.
19. Schmidt, M. B. *Beitr. path. Anat.* 1905, **7** (suppl.), 419.
20. Hurst, E. W. *Med. J. Aust.* 1941, ii, 1.
21. Henson, R. A., Russell, D. S. *J. Path. Bact.* 1942, **54**, 227.
22. Baker, A. B. *Amer. J. Path.* 1935, **11**, 185.
23. Margulis, M. S., Soloviev, V. D., Shubladze, A. K. *J. Neuropath. exp. Neurol.* 1944, **3**, 101. *Abstr. World Med.* 1948, **4**, 89.
24. The findings of the commission are summarised on p. 1110.

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be checked by disease or famine. But while the commission are not exhorting us to convert England's green and pleasant land into Calcutta's black hole, they believe there are good reasons for at least replacing ourselves in succeeding generations. As they very moderately put it, "it is possible to hold widely different views about the desirable size of population in relation to national resources and responsibilities and yet . . . to agree that if over a long period parents have families too small to replace themselves, the community concerned must undergo a slow process of weakening." For the past eighty years some 85–88½% of our people have been marrying; but where couples in the mid-Victorian era had an average of 5½–6 liveborn children, couples married in 1925–29 have had 2·2. The commission attribute this fall very largely to deliberate family limitation, and find no substantial evidence of a decline in reproductive capacity. They even feel that the reverse may be the case: "The British people of today are on average better fed and fitter than their grandparents were: it would seem unlikely that the capacity to produce children should not have been to some extent favourably affected, as other physical powers have been." It is hard to be sure that this argument is sound, for in nature it is the failing or threatened species which becomes abnormally fertile, whereas species which are secure and doing well may reproduce themselves less freely. That family limitation is an important cause of the decline in family size cannot however be doubted. At first it went on fastest among those in the higher occupational categories; and in couples married between 1900 and 1930 the average was 2·5 children for manual workers and 1·7 for the other groups. Thus it is exceedingly interesting that in recent years—in couples married between 1927 and 1938—this trend has shown signs of being reversed, family size having risen among non-manual workers while continuing to decline among some sections, at least, of the manual workers.

There have been other recent changes in the trend of the birth-rate. The decline which had gone on for many years was checked in 1933, and after a stable period the rate rose rapidly in 1941, and showed a further rise after 1945. This was no mere post-war phenomenon, such as followed the 1914–18 war. It was associated with a greater number of early marriages and with the fact that the size of families has for the time being ceased to decline, though there is no evidence, at present, that completed families are getting any larger. Our family average of 2·2 will not replace the race, though it comes near it; the commission put the deficiency at about 6%, and are sure it is not nearly as great as pre-war calculations suggested.

The age-balance of the population naturally occupies the commission considerably. The rise in the proportion of those in the working-age group between 1891 and 1947 has contributed to the rise in our standard of living in the last seventy years; but the position will be reversed in the coming thirty, as the proportion in the higher age-groups rises. They foresee the need, which we have often mentioned, to make use of the powers of people who have reached retiring age but wish to go on working; but lest this should end in frustration for the young promising people who are hoping for promotion they suggest that later retirement should not be allowed for those who hold posts at the top. These can become consultants or take on less responsible work. The commission are not unduly alarmed about the effect of the general trend of the birth-rate on national defence, though they note that there will be an absolute fall in the next ten years of young men between 15 and 40, and that this fall will continue if families remain the same size as was customary before the war. A small rise in average family size, however, would arrest this fall.

Social advances in the last hundred years have brought better care for children. But schooling has meant that a young child no longer has its living in its hands, as it had in COBBETT's day; and restrictions on the use of juvenile labour have increased the burdens of parenthood while relieving the child and improving his nurture. Parents now regard the limitation of the family as "a normal part of personal responsibility," and the commission do not criticise them for this. Indeed, they think that it should be a duty of the National Health Service to give advice on contraception to married people who want it, while the service should also undertake the investigation of subfertility. From 5 to 8% of all marriages are involuntarily childless, and the report contains suggestions for special fertility clinics on a regional basis as part of the N.H.S. The establishment of the service should itself help to promote family welfare: "It places non-earning mothers and children for the first time on an equality in respect of medical service with the earning members of the family; it should remove or reduce the costs of medical care as a handicap of parenthood; and . . . it may strengthen the concept of the family doctor as health adviser and link between members of the family and the specialist services they may need."

The commission were specifically invited "to consider what measures, if any, should be taken in the national interest to influence the future trend of the population"; and nearly all the measures they recommend are designed to relieve the burden on parenthood. Rationing and some other war-time arrangements helped to relieve this burden; and the same ends, they say, should be sought in peace-time. They favour a higher rate of family allowances, preferably without exclusion of one child; a scale of income-tax relief rising with income to a maximum of £150 per child; more help for mothers of young children, through nursery schools, day nurseries, home helps, and sitters-in; a better maternity service; development of the war-time arrangements for the better nourishment of mothers and children; a programme of housing which takes more account of growing families; education in family life both at school and later; and a closer study of population trends. In all this they have been wonderfully unanimous (only one member differing on one relatively small point); and they will carry with them the 85–88½% of married couples in the country, as well as all spinsters and bachelors of good will. At the same time it has to be remembered that relief of taxation was found impossible in the last Budget, and though the commission's proposals are all intended for immediate adoption they would probably involve discovering alternative sources of revenue.

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Annotations

THE APPEALS

THE reviewing committees, enlarged by two outside members, are now considering appeals from their decisions on the grading of specialists. The task must be difficult and distasteful, but we trust that it will be performed very carefully, including local inquiries where there is any doubt. When the Spens report appeared, it was generally supposed that the large majority of specialists would be accepted as such, and that the ablest among them—the consultants—would be distinguished by the merit awards. The policy actually adopted, however, has been to reserve specialist status for these consultants and reduce many practising specialists to the rank of senior hospital medical officer. Provided there are ample opportunities for later change, and provided a large number of new consultant posts are created in the next few years, this change of policy can probably be justified as being in the ultimate interest of the service. But nobody should underestimate the immediate harm done by depriving a considerable number of doctors of the status which in practice they have long enjoyed. It is fairly easy to defend the grade of senior hospital medical officer for men and women who are working as subordinates; but it is very difficult to defend it for some of those who, in their own area, will continue to have full and final responsibility for beds and patients or are in charge of important units and departments.

The reviewing committees hold in their hands the reputation of the new service for equity. As in our article of May 7, we suggest to them that to withhold consultant status from those who deserve it may be a graver error than to grant it to those who do not.

LOCATION OF BRAIN TUMOURS WITH RADIOACTIVE PHOSPHORUS

THE site of a cerebral lesion can often be accurately determined by painstaking analysis of the history and clinical signs. Its location can be further defined by intracranial air studies, angiography, and electroencephalography, all of which have, during the past few years, had technical refinements added to them which extend their value. When the information that these can give regarding both the site and the nature of the lesion is thoughtfully integrated with the primary clinical findings, the neurosurgeon can operate, in the great majority of cases, with a clear impression of what he is looking for and where to look for it. Nevertheless there are occasions when the surface of the brain exposed at operation appears normal and gives him no clue to the site of the lesion he is sure it contains. Brain needling will then sometimes give the answer, but not always. The intravenous injection of dyes, such as brilliant-green, which appear to be selectively absorbed by certain tissues, including tumours, has been evolved to meet this difficulty but has not gained wide acceptance. Now Selverstone and his colleagues[1] in Boston, Mass., are using radioactive phosphorus for the precise localisation of tumours at operation. The radioactive phosphorus is given intravenously in a dosage of 1–4 millicuries within 3 days of the operation. The radioactive material is, they claim, selectively absorbed by tumour tissue; so when the brain is exposed at operation it is possible, by probing with a Geiger-Muller counter fitted into a container no larger than an ordinary brain needle, to detect the tumour by the immediate rise in counting-rate that it produces. In nine cases where the tumour did not present on the surface in the operative field it was accurately sited by this method. In some of these the location could perhaps have been done as well by ordinary brain needling. But where density differences between normal and pathological tissue are slight the new method may be a useful technical advance. It is unlikely to occupy a large place in routine neurosurgical procedure, and would do so only where proper neurological diagnosis had become slovenly.

If the relatively great concentration of P^{32} in tumour tissue, which is the basis of this technique, is confirmed, the therapeutic implications may well be more worth developing than the diagnostic. First we shall have to know more of the effect of such radiation on normal surrounding brain.

1. Selverstone, B., Solomon, A. K., Sweet, W. H. *J. Amer. med. Ass.* 1949, **140**, 277.

OBSTETRICS AND GYNÆCOLOGY ON THE SCREEN

SEVERAL new obstetrical and gynæcological films were lately shown by the medical committee of the Scientific Film Association to a meeting of London teachers at the Royal College of Obstetricians and Gynæcologists. *A Normal Delivery*,[1] intended to introduce the subject to students at the Rotunda Hospital, starts by emphasising the need for efficient scrubbing-up and shows the rigorous cleansing technique applied to the perineum at this hospital. Observation of the descent of the head is interrupted by an animated diagram sequence illustrating the three phases of the Rotunda delivery technique, where the woman lies in the left lateral position and flexion of the head is maintained with occipital pressure by the attendant while descent is encouraged by submental pressure through the perineum. This is next demonstrated on the patient and the delivery completed, including the immediate care of the infant. *Kielland's Forceps*[1] is designed for postgraduates. These forceps, for high transverse arrest, are rarely used in England but well liked in Dublin. The film shows their characteristics and illustrates their insertion and manipulation first on a puppet in a dried pelvis and then in an appropriate case. *Breech Delivery*,[2] from Edinburgh, shows two deliveries under gas-and-air analgesia; the first, with extended legs, is delivered by jaw-and-shoulder traction, and in both deep episiotomy is afterwards repaired.

In the discussions which followed them the obstetric content of all three films was criticised; several speakers said they would not like to have obstetrics like this shown in their school, and came to the conclusion that each would have to make his own films on each subject for teaching in his school. Dr. Malcolm Donaldson pointed out that such individual film production was a wasteful procedure, for film making was expensive both in effort and in money; he suggested that teachers in several schools should meet and decide what they wanted shown in any one film and then have it made jointly. The films differed in that the second eliminated anything not directly germane to the particular topic, whereas the third included all that had occurred on the occasion recorded, giving as much emphasis to the episiotomy and its after repair as to the delivery of the child. Speakers were divided on the relative merits of these two approaches.

A short filmstrip, *Cancer in Gynæcology*, made by the British Empire Cancer Campaign, was given its première. Charts, artist's drawings with a humorous twist, and case-records were all combined in coloured pictures and accompanied by a recorded talk to remind practitioners of the leading facts about gynæcological cancers and the need for early investigation of any case of irregular bleeding. This audience of teachers received it well, and it should succeed in its aim to start with a swing discussions on this subject at clinical meetings. *Girls*

1. *A Normal Delivery* and *Kielland's Forceps*: 16 mm. silent, colour. Made by the Master of the Rotunda Hospital and Dr. Brian Stanford with SIMPL Ltd. Available from Reckitt and Colman Ltd. (Pharmaceutical Department), Hull. 20 minutes each.
2. *Breech Delivery*: 16 mm. silent, colour. From the Department of Obstetrics of the University of Edinburgh. 22 minutes.

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Growing Up,[3] designed for adolescent school-girls, describes the significance of onset of menstruation; set at a middle-class level, it should be useful in teaching many a little while offending very few; preliminary reports already show that it has been approved in schools. *Care of the Premature Infant*,[4] from the Rotunda, is a quick survey for interested visitors to their unit. It shows how to cut out gamgee clothing, prepare the cot, administer thyroid, and carry out gavage; made at a superficial level, it is mainly of local value.

Several lessons were learnt from the screening of this programme. Yet again it was evident that performances lasting more than $1^1/_2$ hours, even when as interesting and as varied as this, tax endurance to the breaking point. Few of those present can have had much experience of teaching with film, for most of the comments appeared to be based on opinions rather than on practice. It was also evident that teachers of obstetrics are not yet ready to demonstrate by film techniques performed by other obstetricians; this is an attitude common among British surgeons but almost unknown in most of the Continental medical schools. It would therefore seem wise for our medical film enthusiasts to devote their energies at present to recording clinical conditions which exist as indisputable fact and can be used as teaching material by any school.

SIR WILLIAM GOWERS

As a force in neurology, William Gowers has been overshadowed by Hughlings Jackson, largely because Jackson's approach was physiological, while Gowers' was that of a clinical observer and a contemporary teacher. The great neurologists whom he taught have all described his influence on their work—an influence as great as Jackson's upon their way of thinking. Dr. Critchley, in ending his new biography,[5] says: "Comparison with Jackson is a thin pursuit, for the two great men were very different in terms of thoughts, in culture, and in temperament. They make a perfect and harmonious pair, Jackson's vision dovetailing into Gowers' superlative gifts at the bedside; the one a thinker and speculator, the other a diagnostician and teacher." It is unlikely that anyone will quarrel with the statement that "William Gowers was probably the greatest clinical neurologist of all time"—"clinical" being essential to that statement. The little book which Gowers wrote on the *Borderland of Epilepsy* would have sufficed to keep him in the front rank long after his lectures and demonstrations had been forgotten; and here it must be remembered that it was he who began the method of case presentation and argument that is still carried out by the staff of the National Hospital, to the entertainment—and perhaps also to the benefit—of most aspiring physicians. His descriptions of diseases cannot be surpassed, even though he described them before their ætiology was understood. In his descriptions he set fashions, and the terms "abiotrophy," "fibrositis," and "knee-jerk" are his; but apart from writing and from neurology, he was also responsible for a hæmoglobinometer, a method of estimating blood-sugar, recognition of unusual albuminuria, a safety syringe, and a school of medical shorthand. Likewise he was an excellent illustrator. All this, and his personal characteristics, are dealt with in Dr. Critchley's most readable book, the fruit of both inquiry and scholarship.

The centenary of the birth of Gowers was obscured by the final stages of the war. Dr. Critchley has done well to bring him back into our thoughts.

3. *Girls Growing Up*: 16 and 35 mm. sound, monochrome. Made by Merton Park for Southalls Ltd. Available from Sound-Services, 269, Kingston Road, London, S.W.17. 10 minutes.
4. *Care of the Premature Infant*: 16 mm. silent, colour. Made by Dr. W. R. F. Collis at the Rotunda Hospital with Dr. Stanford and SIMPL Ltd. Available from Reckitt and Colman Ltd., Hull.
5. Sir William Gowers, 1845–1915. By MACDONALD CRITCHLEY. London: Heinemann Medical Books. 1949. Pp. 118. 17*s*. 6*d*.

ARBITRATION AT MINISTERS' DISCRETION

WRITING in Monday's *Times* on the National Health Service (Amendment) Bill now before Parliament, Sir Lionel Whitby points out that when disputes arise over the remuneration or conditions of service of doctors and other people working in the N.H.S. it will rest with the Minister of Labour to decide whether the dispute shall be referred to arbitration. The Government, he remarks, seem to have forgotten a pledge to the profession:

> "So long ago as October, 1947, proposals for the establishment of Whitley machinery in the health service were issued by the Government. In these it was stated that the Government 'are anxious to accord the fullest rights to arbitration, subject to the preservation of the Government's prerogative. A code of conduct is unlikely to be arbitrable, but a simple proposal for a change in wage or salary rates almost certainly is.' This promise was repeated in the revised proposals issued by the Ministry in March, 1948, and supplemented by verbal assurances during the discussions which preceded the Act. Not the slightest doubt was left in the minds of those who discussed the subject with the Government that the promise of Whitley machinery in the health service carried with it the fullest rights to compulsory arbitration."

On May 28 the *British Medical Journal* noted that the Bill empowers the Minister of Labour to refer disputes to an industrial court either for settlement or for advice: "while a Minister could readily refuse to refer a dispute for settlement, he might hesitate to refuse to seek advice, and if the advice went against him he might find it difficult to tell Parliament that the matter should rest unchanged." But, said the *B.M.J.*, the clause is unlikely to afford doctors much protection; for the decision whether arbitration shall or shall not be undertaken rests with the employer's side. On the face of it, the value of arbitration machinery is much reduced by any such condition, and we shall be interested to know how the Minister of Health can defend it. Sir Lionel Whitby's final question needs an explicit answer. "Now that the State is becoming the universal employer—and paymaster—are we to infer," he asks, "that arbitration is to become a privilege given only to some sections of the working community, instead of a right accorded to all?"

SECOND WORLD HEALTH ASSEMBLY

THE grace and panoply of a Rome June welcomed the delegates of 60 member countries at the opening of the second World Health Assembly on June 13 in the Palazzo Venezia. The Italian government had gone to much trouble in making the 15th-century palace of cardinals and ambassadors—recently Mussolini's lair and now a museum—fit to house a 20th-century international conference; and the opening meeting was honoured by the presence of the President of the Republic, the prime minister, the foreign secretary, and other ministers.

The assembly got down rapidly to business. By the second morning it had elected Dr. Karl Evang (Norway) as its president, with the Italian high commissioner for health, Prof. Mario Cotellessa, as honorary president; had set up its three main committees, and elected their chairmen (programme, Dr. van Zile Hyde, of the U.S.A.; constitutional questions, Dr. Paul Vollenweider, of Switzerland; administration and finance, Dr. Bruno Schober, of Czechoslovakia); and had elected a general or steering committee of the principal officers of the assembly with eight additional members. The names of these eight members, submitted by the nominations committee, were challenged by the Latin-American group on the ground of insufficient representation of their own area, and by the Philippines, who wished themselves to be represented; but a ballot confirmed the original nominations.

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The presidential address—as would be expected by those who know Dr. Evang and his record—was an inspiring appeal for the Common Man, and included a call to the U.S.S.R. to renew collaboration. The general speeches that followed, on the reports of the director-general and the executive board, included attacks on the policy of W.H.O.—and on the U.S.A. in particular—by Czechoslovakia, Hungary, Bulgaria, and Poland, who complained of discrimination in the supply of medical equipment, notably the American refusal to give export licences for Podbielniak extractors for the production of penicillin. Although these attacks contained language unusual at health congresses, and veiled threats of withdrawal, the general implication seemed to be that not only was non-coöperation not contemplated but the door was not necessarily closed even on U.S.S.R. collaboration. The complaints heard previously from the same quarter, of swollen staff, excessive salaries, and unsound geographical distribution of staff, were reiterated but without any detailed or constructive suggestions: somewhat better founded was the charge that these countries had not received what they had most wanted from W.H.O., because of the system of priorities: no doubt the assembly will take this into consideration in adopting the programme for 1950.

Other noteworthy speeches included that of Rajkumari Amrit Kaur, minister of health for India, whose sincerity and evident wish to use W.H.O.'s help deeply impressed the assembly. Dr. Melville Mackenzie (U.K.) struck a note of caution based on the approach of "suitability for international action." This approach is the best means of reconciling the divergent tendencies of so many delegations, which are apt to praise concentration of effort and then propose a variety of new special projects. Dr. Stampar (Yugoslavia) steered an adroit course between the scylla of Western deviation and the charybdis of Cominform conformity, and Surgeon-General Leonard Scheele made a temperate but firm repudiation of discrimination by the U.S.A. and a declaration that his country was wholeheartedly behind W.H.O. in its programme.

Three weeks have been allotted to the assembly.

CLOSURE OF THE LOCK HOSPITAL

THE North-West Metropolitan regional hospital board decided on June 13 that the London Lock Hospital, Dean Street, should no longer be used for the treatment of venereal diseases and that its premises should become the nucleus of the West End Hospital for Nervous Diseases, which was severely damaged in the war. This decision, reached after the proposal had been referred for reconsideration, affects both the wards of the Lock Hospital, which were shortly to be reopened, and its outpatient clinic, which in 1948 dealt with 2433 new cases and total attendances of 24,800. The board have satisfied themselves that other hospitals within easy reach of Dean Street—notably St. Paul's, University College, and the Middlesex Hospitals—can cover the needs of the Lock's clientele more than twice over, whereas the West End Hospital's service is not adequately covered elsewhere.

The prevention of wasteful overlapping of hospital services is one of the main functions of the regional boards; and, though in the 200 years since its foundation at Hyde Park Corner the Lock Hospital has built up a valuable local reputation for wisdom and kindliness, it is for the board to decide whether its work can be as effectively and more economically done by sharing it among other hospitals. Teaching, however, is outside a regional board's purview; and it remains questionable whether the teaching of venereology in London would not have benefited by the retention and renovation of the Lock Hospital as a centre for postgraduate training.

N.H.S. AND E.C.A.

Mr. W. A. Richardson, editor of *Medical Economics*, returning to the United States after examining the National Health Service, is reported [1] as saying that this country's programme of socialised medicine could not be carried out without American dollars given under the Marshall plan. There is of course a sense in which all our activities depend on the generous effort of the American people to set the European economy again on its feet; for without that effort the whole pattern of our lives would probably have changed to something far simpler and uglier. If Mr. Richardson merely means that without E.C.A. we should have had no National Health Service, perhaps he is right. But if he is suggesting that the service is conducted at the expense of our American friends, that is quite another matter. Whether we choose to pay for medical care by private fees and charitable benefactions on the one hand, or by compulsory contributions and taxes on the other, is entirely an internal affair: we are simply redistributing the burden among ourselves as we think best. The Americans can be supposed to pay for the N.H.S. only in so far as its establishment has increased this country's difficulty in earning dollars and has thus made us more dependent on Marshall aid. If the N.H.S. has diverted labour or materials from the dollar-earning industries, or has appreciably raised costs in those industries, the criticism can be maintained; but not otherwise. We were glad to hear of this week's denial from Mr. Finletter, E.C.A. minister here, that the idea has any substance.

CONFERENCES ON THERAPY

THE technique of teaching by recorded expositions and the subsequent cross-examination of teacher by student was probably begun by Sir Byrom Bramwell in Edinburgh at the end of last century, when he published his famous *Clinical Studies*. The technique of the recorded clinicopathological conference was developed by Cabot in Boston, and the Cabot cases became renowned and valuable factual records. The success of the method has now led to further growth and development, and clinicopathological conferences form a focusing point of medical educational activity in most of the American schools. Other conferences are now being developed on clinical and research problems, and Cornell Medical School makes a special point of arranging conferences on therapy. The conversational reporting makes the published volumes interesting and easy to read. Cross-examination of the opening speakers by other members of the staff helps to clarify uncertain points, and also to reveal those on which knowledge is uncertain or lacking. In the latest volume,[2] discussions on the management of congestive heart-failure, streptomycin, protein hydrolysates, pneumonia, BAL, hepatic insufficiency, and thrombophlebitis are to be found among others. The speakers often take a novel line which sometimes leads them into deep water, and a good many contrary opinions are expressed. But that is partly where the value of the method comes in. The only question is whether so lavish a method of reporting lends itself to publication in book form. Perhaps the best place for recording these discussions is the journals, and in fact most of them are already in print in the *American Journal of Medicine* and elsewhere. The demand for the collected reports, however, seems to be high in the United States, and there are now three volumes in this series from Cornell.

1. *Daily Telegraph*, June 17.
2. Cornell Conferences on Therapy: vol. III. Edited by HARRY GOLD, M.D. New York and London: Macmillan. 1948. Pp. 337. 17*s*. 6*d*.

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Special Articles

REPORT OF THE ROYAL COMMISSION ON POPULATION

THE Royal Commission on Population, which was set up five years ago (March, 1944), has now published its report.[1] The commission's terms of reference were :

> " To examine the facts relating to the present population trends in Great Britain ; to investigate the causes of these trends and to consider their probable consequences ; to consider what measures, if any, should be taken in the national interest to influence the future trend of population ; and to make recommendations."

Associated with the commission were three scientific committees—Statistics, Economics, and Biological and Medical—separately appointed to advise on the scientific aspects of the inquiry. The reports of these committees, as well as the report on the family census which the commission carried out in 1946 and reports on other special investigations, will be published later.

THE 19TH CENTURY AND AFTER

The report surveys the phenomenal growth of the population of Great Britain from about 7 million in 1700 to 49 million in 1949—a sevenfold increase—after many centuries during which numbers changed little. Other countries in Europe also grew rapidly in the 19th century, though not so rapidly as Great Britain. The growth of population in Great Britain, the commission say, " was an essential condition not only of the development of Britain itself as a great and rich nation, but also of the growth of the new overseas countries inhabited mainly or largely by people of British descent, and of the spread of British culture and influence all over the world through emigrants, commerce and capital investment." On the other hand, growth of numbers at the 19th-century rate could not have continued without disaster. It would have produced a population of 130 million by the year 2000 and 460 million by 2100. Fortunately, the rate of growth was slowed down by other forces before the Malthusian checks of famine and disease would have come into operation.

The slackening of growth during the 20th century is traced to the fall in average family size which began about the 1870's. The average family size in Victorian times was $5^1/_2$ to 6 ; it is now about 2·2. One-child and two-child families have taken the place of 5, 6 and 7 children as the most common size.

A striking change has taken place also in age-distribution. In the 19th century the younger generations were always larger in numbers than their elders ; whereas in the 1947 population of Great Britain the numbers under 20 were actually less than those aged 20–40. The proportion of young people under 20 has fallen heavily, while the proportion over 60 has doubled, and the average age of the population has risen from under 27 years in 1891 to 35 years in 1947.

The fall in births was checked in 1933. The annual numbers of births rose rapidly during and after the war, and, although they are beginning to fall again, the average for the 6 years 1943–48 was well above pre-war. The commission's analysis traces the rise to two main influences : (1) younger marriage which led to the rapid growth in the number of young married couples, combined with (2) the fact that average family size after falling for half a century has (for the time being at least) ceased to decline. Despite the large increase of births in recent years the average size of family has been comparatively stable over the past 20 years at approximately 2·2 children. This represents something less than is needed for the replacement of the population. This deficiency, computed roughly at 6%, is not nearly as great as the pre-war reproduction-rate calculations suggested.

CAUSES OF THE FALL IN FAMILY SIZE

The fall in family size is not due to any decline in reproductive capacity. The main, and very probably the only, cause is the spread of deliberate family limitation. This is traced to powerful economic, social, and cultural forces which combined to tell against the continued acceptance of an uncontrolled birth-rate. In the 70 years which have elapsed since family limitation began to spread, the forces behind it have on the whole become stronger. Public education, humanitarianism, emancipation of women—all of which are adverse to unrestricted childbearing—have continued and developed. The commission say that one peculiar and unexpected effect of the great social advances achieved since the 19th century—higher standards of child care, extension of the age of compulsory education and restrictions on juvenile labour, wider opportunities for social promotion, more leisure, and wider opportunities for its enjoyment outside the home—is that they have either added to the costs of parenthood or in other ways emphasised the handicaps of parents relative to others.

This unexpected effect of higher standards of living and of great social and economic changes, the commission say, has in general been overlooked until recently. It has led some to argue that the higher the standard of living, of education, of social security, the lower is the birth-rate likely to be. This has been true in the past and no doubt would be true in the future unless higher standards of living were accompanied by adjustments that would reduce the advantages enjoyed by non-parents over parents and of the children of the small over those of the larger families.

The gradual permeation of the small family system through nearly all classes has to be regarded in the commission's view as a fundamental adjustment to modern conditions. The most significant feature of this adjustment is the gradual acceptance of control over the size of one's family, particularly by means of contraception, as a normal part of personal responsibility.

FUTURE PROSPECTS

Fewer Young Adults : More Old

Some predictions about the future which do not depend on the future course of births can safely be made. These include the following (migration apart) : (1) the number of young adults (15–39) is likely to decline by about 1,400,000 over the next 15 years ; (2) the number of old people (over 65) will grow steadily over the next 30 years, by at least 2,300,000 and very probably much more ; and (3) the population of working age is likely to remain roughly constant for at least the next 30 years. If, as seems likely, death-rates fall in future the numbers of the old will greatly increase.

Fewer Births

Over the next 15 years the annual number of births will almost certainly decline as a result of the fall in the number of recently married couples which must be expected. The total population will probably go on growing for at least one or two decades, though the increase in this period is not likely (immigration apart) to exceed more than a few millions. If average family size remains at the same level as among the couples married in the decades just before the war, total numbers

1. H.M. Stationery Office. Pp. 259. 4*s*. 6*d*. The Royal Commission consisted of : Viscount SIMON (chairman until May, 1946), Sir ALEXANDER CARR-SAUNDERS, Sir HUBERT HENDERSON (chairman since May, 1946), Prof. A. W. M. ELLIS, F.R.C.P., Dr. ETHEL CASSIE, Lord CRANBROOK, Lady DOLLAN (resigned in June, 1946), Mr. R. C. K. ENSOR, Sir JOHN HOBHOUSE, Mrs. M. C. JAY, Mrs. G. LONGMOOR, Mrs. G. P. HOPKIN MORRIS, Lady OGILVIE, Mrs. H. H. PAWSON, Mr. ALFRED ROBERTS, Sir WILLIAM ROBIESON. Secretary, Mr. N. F. MCNICOLL ; assistant secretary, Mr. W. A. B. HOPKIN.

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will reach a maximum round about 1977 and will thereafter begin a slow decline. On the same assumption the population of working age, which is likely in any case to remain roughly constant for the next 30 years, will also decline slowly thereafter; the young-adult group, which is already falling, would continue to decline after 1962 though at a much slower rate; and the child population would show this gradual falling trend even earlier. The average age of the population is likely to rise by at least another 3 years over the next 30 years and will rise more than this if the future brings either a substantial fall in average family size or a reduction in death-rates at high ages.

Changes in Sex Ratio

The increase in the proportion of men to women in the population which has been in progress recently must be expected to continue in future and may produce a small excess of men at the reproductive ages.

Family Size

The future trend of average family size cannot be predicted with any confidence. A further spread of family limitation must be expected and will tend to reduce average family size, but only slowly. There are some signs that opinion in recent times has been turning against the very small family. Moreover, war-time circumstances and Government policy, operating through full employment, rationing, price-control, subsidies, taxation, and family allowances, have materially reduced the economic disadvantages of parenthood for the mass of the population. But in the absence of new measures to relieve the burdens of parenthood it seems on the whole likely to the commission that this combination of forces will be less powerful in future than they have been in the past 10 years. On the other hand the fact that couples have recently been marrying younger will tend in various ways to raise the average size of the family. A small increase in average family size cannot be ruled out; but nor can a return to the former declining trend.

INESCAPABLE PROBLEMS

Among the problems presented by the trend of population a number are inescapable because they arise from changes that have already occurred or are in progress, particularly in the rate of growth and the age-distribution of the population. These include the effect on the budget of the increase in the numbers of the old at the same time as the numbers in the working-age groups are no longer increasing; the adjustment of industrial organisation and national policy to the fall that is taking place in the numbers of young adults; and the effects of other changes in age-distribution on housing, education, and other branches of social policy.

More Employment of the Old

The report points out that the increase between 1891 and 1947 in the proportion of the working-age groups relative to others was an appreciable factor in the rise in the standard of living over the last 70 years. This favourable influence will be reversed over the next 30 years. The proportion in the working ages will still be well above the 19th-century level, but account has to be taken of the rise since then in the standards of consumption of dependants, young and old, in relation to those of the active population. The expected large increase in the numbers of the old makes it very desirable that we should make better use of their productive capacity. This means later retirement generally and other adjustments.

The cost to the Exchequer of retirement pensions, making no allowance for any future fall in mortality, is estimated to increase from £238 million in 1948 to £501 million in 1978. With the increasing numbers of the old and consequently their increasing strength as a political pressure group, it is important that the implications of proposals for increased pensions should be realised.

Promotion of the Young

Among the other points that arise out of the further ageing of the population one is that competition for promotion may be expected to increase, and a powerful sense of frustration may arise among the young. This would reinforce the demand for earlier retirement which on other grounds would be against the national interest. It is essential, however, to secure that experience in leadership should begin early, and that the community should get the full benefit of the diminishing supply of youth. Later retirement therefore should not apply to posts at the top. The fall over the next 10 years in the absolute numbers of young men between 15 and 40 is of special significance for national defence. The commission point out also that with a diminishing proportion of young people it is possible that the community might lose something in energy, initiative, enterprise, and other qualities associated with youth.

IS IT DESIRABLE TO CHANGE POPULATION TRENDS?

The commission's examination of the question whether it is desirable to try to influence the future trend of population, includes the following points.

Economic Prospects

The most important economic consideration is the pressure of population on resources. This turns in modern conditions on the possibility that increasing imports of food and raw materials may be difficult to obtain and only obtainable on terms of trade that steadily worsen. This danger, the commission say, is perhaps more likely to be overrated than underrated today. The next 10 years should throw a clearer light on Britain's economic prospects. For the present it can be said that the uncertainties of the future regarding world supplies of food and the opportunities for British export trade give us good reason to be thankful that no further large increases in our population are probable.

Migration and the Commonwealth

A low level of average family size discourages emigration and encourages immigration; and it seems on the whole likely that the present boom in emigration will be short, emigration will tend to diminish, and there may be continuing pressure to bring in immigrants to make good shortages in particular occupations. This prospect the commission regard as among the undesirable consequences of a subreplacement family size, because (*a*) the sources of supply of suitable immigrants are meagre and the capacity of a fully established society like ours to absorb immigrants of alien race and religion is limited, and (*b*) a diminishing flow of British emigrants to other parts of the Commonwealth may have serious consequences for the economic and political future of Great Britain and the Commonwealth as a whole.

Commonwealth Study Recommended

Even if average family size were maintained in Great Britain at replacement level or a little over, which is the most that seems probable, it is unlikely, given good economic conditions here, that emigrants from Great Britain would amount to more than a third or a quarter of the immigrants which the Dominions would need if they wanted to maintain even their pre-war rates of growth. It is likely therefore on present trends that the British element in the Commonwealth will tend to diminish. The commission say: "This fact presents a problem of vital concern to the whole Commonwealth and we urge that it should be studied jointly by the Governments of Great Britain and the other Commonwealth countries." This study would of course bring under review Great Britain's economic prospects and the political and strategic implications of the use of

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atomic energy and other developments that affect national defence. These might alter the whole picture by either greatly increasing the desire to emigrate or dictating a deliberate policy, however difficult it might be in execution, of redistributing the man-power of the Commonwealth.

Influence of Western Civilisation

The commission point out that the population of the U.S.A. is now nearly three times, and that of Soviet Russia nearly four times, that of Great Britain, and no change in future numbers that is at all likely would reduce these proportions; indeed they must be expected to increase. Britain's future however is bound up with the Commonwealth and Western civilisation. The shift of world affairs is giving a new emphasis to the conception of Western civilisation as an entity possessing reality and value. The rate of increase of the peoples of Western civilisation has markedly declined while that of Oriental peoples has markedly accelerated. The establishment or continuance of size of family below replacement level might accentuate a change in relative numbers as radical as that which occurred between France and Germany in the 19th century and might be as decisive in its effects on the prestige and influence of the West. This question is not merely one of military strength and security; it merges into more fundamental issues of the maintenance and extension of Western values and culture. The effective force of this wider commonalty depends on the vitality of its constituent parts, which in turn is affected by their trends of population.

Although the size of the family could not continue permanently below replacement level without leading to national extinction it is conceivable that it might remain well below this level for a long period, recovering later so that the population would ultimately be stabilised at a lower total. Average family size however, as our history has shown, is capable of falling far, and it may also be capable of recovery, but it does not lend itself to precise and prompt adjustments.

Replacement Family Size Desirable

The commission have no hesitation in concluding that a replacement size of family is desirable in Great Britain at the present time. They point out that it is impossible for policy, in its effects as distinct from its intentions, to be "neutral" on this matter since over a wide range of affairs policy and administration have a continuous influence on the trend of family size.

WHAT MEASURES SHOULD BE TAKEN?

Reviewing the problem of what measures should be taken to influence the future trend of population the commission point out that in all classes of society except the very wealthiest, married couples with young children to support are still at an economic disadvantage as compared with those of the childless couples; and parents with a family of several young children are at a disadvantage as compared with those with only one or two. In the process of social advance, until recently, the family has been overlooked or given only a minor place in social policy. The development of social policy has become lopsided. While expenditure on children's allowances is reckoned in terms of millions, that upon old age pensions is reckoned in hundreds of millions.

Possible Effects on National Intelligence

The advantages which the small family has in our society and the general discouragements of parenthood are reflected in the differential birth-rate. Of the social groups, those with the highest incomes, and among individual parents within each social group, the better educated and the more intelligent, have smaller families on the average than others. The average size of family of professional and administrative workers is about 1·6; that of general labourers is more than double this figure. The commission received an impressive weight of expert evidence to the effect that there is inherent in the differential birth-rate a tendency towards lowering the average level of innate intelligence of the nation, and they recommend that the Government should arrange for a thorough investigation of this question.

A Programme of Family Welfare

Public policy should assume, and seek to encourage, the spread of voluntary parenthood; it should assume also that women will take an increasing part in the cultural and economic life of the community, and should endeavour, by adjustments of social and economic arrangements, to make it easier for women to combine motherhood and the care of the home with outside interests.

CONCRETE PROPOSALS

Among the many proposals which the commission make for initiating a programme of family welfare are the following:

Family Allowances and Income-tax Reliefs

(1) The rate of free allowance under the Family Allowances Act should be increased forthwith to 7*s*. a week, and for children of 11 years or over 10*s*. a week, subject to the exclusion of the youngest child of the family;

(2) when financial conditions permit the limitation which excludes one child in each family from the scope of the allowances should be removed;

(3) so long as the exclusion of one child is retained, a moderate lump-sum payment for the first birth should be made instead;

(4) the allowances should be payable in advance of birth, when pregnancy is established;

(5) professional contributory schemes for supplementary children's allowances should be encouraged;

(6) the principle of children's allowances should be reintroduced into the salary scales of officers in the fighting Services;

(7) in computing the income chargeable to income-tax, the deduction made from the income in respect of each dependent child should be either £60 as at present (as a minimum); or one-tenth of the earned income up to £1000 plus one-twentieth of any earned income in excess of £1000, subject to a maximum deduction of £150.

(8) The cash allowance paid under the Family Allowances Act should be exempt from income-tax.

Family Services

As financial circumstances allow, family services should be developed so that help can be given to mothers of young children, through home helps, sitters-in, day nurseries, nursery schools, and other means, not only in emergencies but in the normal running of the household. This will involve a shift of emphasis and corresponding adjustments in the services so far as they exist at present. In existing circumstances no public provision of these services, other than that of the child-minder, should be made for households with an only child who is under 2.

Health Services

The commission say that the National Health Service opens up new prospects of increasing the valuable contribution which the health services make to family welfare. It places non-earning mothers and children for the first time on an equality in respect of medical service with the earning members of the family; it should remove or reduce the cost of medical care as a handicap of parenthood; and it may strengthen the concept of the family doctor as health adviser and link between members of the family and specialist services.

Facilities for investigation and treatment of infecundity should be provided as a regular part of the National Health Service, and research in this and allied problems should be promoted.

Contraceptive Advice

The giving of advice on contraception to married persons who want it should be accepted as a duty of the National Health Service, and the restrictions on the

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giving of such advice by public-authority clinics should be removed. Anæsthesia or analgesia should be available to all mothers who want them, unless there are medical reasons forbidding their use.

Maternity and Child Health

Other proposals based largely on the report of the Biological and Medical Committee are directed to the improvement of the maternity and children services. On the latter the commission point out that the still-birth-rate and infant death-rate in Great Britain are still higher than in some other countries, and that these differences cannot be explained by climate. There is no evidence that the much higher death-rates of the poor are due to inferiority in the capacity to survive, or that any further reduction of the death-rate would merely keep alive children of inferior stock. The commission endorse recommendations for the continuance and development of war-time nutritional policies favouring mothers and children.

Housing

Analysis of overcrowding in relation to family size suggests that in the programme of house building there is undue concentration on the five-roomed house. More larger houses are needed, and the proportion of houses with less than three bedrooms should also be increased. Priority in the letting of local authority houses should be given to families with children. There is a strong case, on the analogy of education and health services for children, for a general system of rent subsidies or rate rebates related to numbers of dependent children. They recommend that the possibility of a general scheme should be examined by an expert committee. Further research into the problems of house design and equipment should include special study of the needs of families with three or more children. A national effort to equip old houses with indoor sanitation, hot-water facilities, and a fixed bath should be made.

Public Opinion and the Family

An educational effort is needed to spread throughout the community some understanding of the broad facts of the population trend and its consequences. Preparation for family life should be given a more prominent place in the educational system. This should be achieved by (1) a wide development of sex education in schools, (2) adjustments of the curricula to raise the status of the practical crafts of home-making and subjects relating to married life, and (3) the development of special courses, at county colleges and centres of adult education, on the psychological aspects of marriage as well as the ordinary domestic subjects.

Population Research

Proposals are made for the improvement of the arrangements for the collection and analysis of fertility statistics, and for continuous research into the wider aspects of population movements. On the former the commission say that they consider it essential (1) that family census questions should be included in the general census at regular intervals, (2) that the statistical divisions of the General Register Offices should be strengthened and raised in status, and (3) that arrangements should be made for the regular analysis and presentation of comprehensive fertility data for Great Britain as a whole.

The commission do not favour the setting up of a new and separate organisation for population research alone at present, but recommend that the promotion and encouragement of this research should be entrusted to the Interdepartmental Committee on Social and Economic Research. The function of the General Register Offices should be extended so as to enable them to further the investigations of the committee. The Lord President of the Council should be made responsible for a continuous watch over population movements and their bearing on national policies.

CONCLUSION

In concluding their report[2] the commission say: "Our inquiry has occupied us for 5 years. Few Royal Commissions have sat so long or wrestled with more difficult and disputed material. Parts of the subject might be likened to that fabled morass 'where armies whole have sunk.'" They say that the crux of their inquiry has been the continuing implications for our society of the revolutionary change that has taken place over the past 100 years in the conditions of population growth. The fundamental implication in their view is that "a community like ours in which birth-control is generally accepted can only prosper or in the long run survive if its members think it worth while to have families large enough to replace themselves. This is not a question only, or even mainly, of total numbers; it is possible to hold widely different views about the desirable size of population in relation to national resources and responsibilities and yet to agree that if over a long period parents have families too small to replace themselves, the community concerned must undergo a slow process of weakening. Our inquiry has convinced us that the relation between the trend of family size and community outlook and policies is peculiarly close, and underlying all our recommendations is our concern to have this fact recognised so that in all relevant branches of policy and administration the population factor will be taken into account."

VITAMIN A IN THE ADULT

A REPORT on the vitamin-A requirement of man has lately been compiled by Miss E. M. Hume and Prof. H. A. Krebs, F.R.S., on behalf of the vitamin-A subcommittee of the Accessory Food Factors Committee.[3]

Extensive investigations were undertaken at the Sorby Research Institute, Sheffield, in response to a request, in 1942, from the Ministry of Food for exact information on the amounts of vitamin A which should be included in the austere war-time diet. In order to obtain direct evidence, 20 male conscientious objectors and 3 women subsisted for long periods on diets deficient in this vitamin and in carotene.

Thus all green and yellow vegetables and fruits, whole milk, cheese, butter and vitaminised margarine, eggs, liver and animal organs, and fat fish were prohibited; while in compensation extra allowances of lean meat, bacon, sugar, jam, chocolate, and skimmed-milk powder, together with unvitaminised margarine, were made available by the Ministry. To ensure that no sources of vitamin A should be overlooked a long list of "permitted" foodstuffs was drawn up, any items which might possibly contain significant amounts of the vitamin being first tested. In the blood-plasma of the volunteers total carotenoids and vitamin A were estimated chemically at fortnightly intervals; the efficiency of dark adaptation was also tested frequently.

In 16 subjects who received the restricted diet without supplements the first noticeable effect was a rapid fall in the plasma-carotenoids from a mean of 140 to 40 I.U. per 100 ml. After the first few weeks little further reduction was observed, and α and β carotene appeared absent from the residual pigments. Data for vitamin A, collected by Mr. T. Moore, SC.D., and Dr. Z. A. Leitner, suggested that the mean value for healthy adults is about 120 I.U., with a slightly higher average for men than for women. In contrast the mean value for the volunteers during the first two months of the experiment was 88 I.U., while the means for subjects remaining on the experiment for 10 months and 20 months were

2. The report is unanimous except for a reservation by Mrs. M. C. Jay on one point—viz., the problem of education costs in middle-class family budgets.
3. Vitamin A Requirement of Human Adults: an Experimenta Study of Vitamin A Deprivation. *Spec. Rep. Ser. med. Res Coun., Lond.* no. 264. H.M. Stationery Office. Pp. 145. 3*s*.

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72 and 61 I.U. respectively. Eventually values consistently under 50 I.U. were observed in 4 subjects. With regard to dark adaptation a decided tendency to decreased efficiency during the winter months was a constant finding. Unmistakable decreases in efficiency outside the seasonal range were observed in only 3 subjects after they had been receiving the diet for 10, 12, and 20 months. Since all these 3 were among the 4 with very low plasma vitamin A the correlation between the two methods of detecting incipient vitamin-A deficiency was satisfactory.

In curative tests, daily doses of 1300 I.U. of preformed vitamin A were found sufficient to restore gradually the power of dark adaptation, and to increase significantly the plasma vitamin A. Daily doses of 1250 I.U. of carotene in fatty solution increased the plasma vitamin A, but to correct defective dark adaptation it was necessary to raise the dose to 2500 I.U.

Further evidence about daily requirements was obtained in prophylactic tests in which 7 of the volunteers were given supplements from the beginning of the experiment. Daily doses of 2500 I.U. of vitamin-A concentrate maintained the plasma vitamin A at normal levels and also prevented defective dark adaptation in tests lasting up to 17 months. Doses of carotene in various forms at about the level of 5000 I.U. daily were equally effective, and also caused the persistence of considerable amounts of carotene in the plasma. From these data the daily requirement for vitamin A, if it is to be derived entirely from preformed sources and with an appropriate safety margin, is assessed as 2500 I.U. For carotene in fatty solution the requirement under similar conditions may be taken as 4000 I.U. When carotene is given in the form of vegetables, however, allowances must be made for inefficient absorption from the intestines.

Extensive experiments upon the amounts of carotene excreted in the fæces of the volunteers indicated that for cabbage and spinach the requirement should be raised to 7500 I.U., and for boiled carrots to 12,000 I.U. As in assessment of the requirement of carotene from mixed sources, an approximation of 7500 I.U., or 3 times the dose of preformed vitamin A, seems appropriate. All these values, it is emphasised, refer to healthy men, aged 20–30 years, and obviously cannot be applied to children, pregnant or lactating women, or the diseased.

In 1941 the committee on food and nutrition of the U.S. National Research Council recommended 5000 I.U. as the daily allowance of vitamin A, with the proviso that this figure should be decreased if an excess of preformed vitamin A was provided; or increased if an excess of carotene was provided. The new British estimates, which have the advantage of being based on successful curative tests, even if only on 3 subjects, do not conflict with the less precisely defined American allowance if the value attributed to carotene is less than half that for vitamin A. The failure of any of the volunteers to show definite evidence of deficiency during the early stages of the experiment is also in accordance with our previous knowledge that the livers of healthy human adults usually contain large reserves of vitamin A, which Dr. Moore and Miss Cooper found to be undiminished in this country during the war.

While a delay of some months might well have been expected before deficiency became apparent by defective dark adaptation and a greatly decreased level of vitamin A in the plasma, the failure of these manifestations to appear in some of the volunteers even after $1^1/_2$–2 years is surprising, and suggests that there is little danger of temporary dietary changes causing vitamin-A deficiency among the healthy adults of this country. Confidence in this conclusion, however, may not be quite complete, since during the course of the experiment one of the volunteers was found to be suffering from tuberculous pleurisy and another from tuberculosis of the spine. An association of these infections with the dietary deprivation seems improbable, but remains a possibility.

For these elaborate experiments, in which many different kinds of routine tests were necessary over long periods, the vitamin-A subcommittee secured the collaboration of many scientific and clinical workers both in Sheffield and elsewhere.

Dr. J. Pemberton and Dr. H. M. Sinclair were responsible for the general clinical examination of the volunteers; Dr. W. J. Wellwood Ferguson and Dr. H. M. Sinclair for ophthalmological examinations; Dr. H. J. Barrie for blood examinations; Dr. Pemberton for fractional test meals and skin biopsies; Miss C. M. Wood, Mr. W. Bartley, the late K. J. W. Craik, Mrs. S. MacPherson, and Dr. P. C. Livingston for measurements of dark adaptation; Dr. J. L. Burn for audiometry; Dr. D. Russell Davis and Mr. W. Bartley for psychological examinations; Mr. W. A. Broom for biological tests of the vitamin-A content of the diet; and Miss K. H. Coward, D.SC., and Mr. J. O. Irwin, D.SC., for statistical help. Chemical examinations of blood, fæces, and food were undertaken at Cambridge by Dr. Moore, Mr. J. Tosic, PH.D., Mr. A. W. Davies, and Miss A. C. Cooper; at Liverpool by Prof. R. A. Morton and Mr. T. W. Goodwin, M.SC.; in London by Mr. T. F. Macrae, D.SC.; at Oxford by Dr. H. M. Sinclair and Miss C. M. Wood; and at Reading by Mr. S. K. Kon, D.SC., and Mrs. E. H. Mawson. Mr. Kenneth Mellanby, SC.D., and subsequently Professor Krebs, supervised the arrangements at Sheffield; Mr. H. A. Garling took charge of the records; and Miss E. M. Hume, of the Lister Institute, acted as general organiser and secretary to the whole team.

STANDING ADVISORY COMMITTEES

THE standing advisory committees constituted by the Minister of Health to advise him and the Central Health Services Council on various parts of the National Health Service have elected the following chairmen and vice-chairmen:

Medical.—Sir Henry Cohen, F.R.C.P. (chairman), Dr. J. A. Brown (vice-chairman).

Dental.—Prof. R. V. Bradlaw, M.D.S., M.R.C.S. (chairman), Mr. H. T. Roper-Hall, M.B., M.D.S. (vice-chairman).

Pharmaceutical.—Alderman W. J. Tristram, M.P.S. (chairman), Mr. R. H. Henriksen, A.R.I.C., M.P.S. (vice-chairman).

Nursing.—Miss C. H. Alexander, S.R.N., S.C.M. (chairman), Alderman A. F. Bradbeer (vice-chairman).

Maternity and Midwifery.—Sir William Gilliatt, K.C.V.O., P.R.C.O.G. (chairman), Mr. Arnold Walker, F.R.C.S., F.R.C.O.G. (vice-chairman).

Mental Health.—Sir Allen Daley, F.R.C.P. (chairman), Dr. W. G. Masefield, C.B.E. (vice-chairman).

Tuberculosis.—Sir Harry Platt, F.R.C.S. (chairman), Sir Robert Young, C.B.E., F.R.C.P. (vice-chairman).

Cancer and Radiotherapy.—Sir Ernest Rock Carling, F.R.C.S. (chairman), Prof. Ernest Finch, F.R.C.S. (vice-chairman).

Ophthalmic.—No permanent chairman has yet been appointed.

The Minister has appointed Miss C. H. Alexander, S.R.N., S.C.M., matron of the London Hospital, to fill a vacancy on the council caused by the resignation of Miss M. E. G. Milne, S.R.N., on grounds of ill health.

LISTER INSTITUTE

THE annual report of the governing body of the Lister Institute was issued last week.

Investigating methods of preserving vaccinia virus without refrigeration, Dr. L. H. Collier has found that desiccation of crude vaccine pulp by Otten's method, with subsequent storage in vacuo at temperatures of 0–4°C, 22°C, and 37°C, did not result in a stable product. Material prepared in this way showed a complete loss of potency when kept at 22°C and 37°C for eight weeks, and considerable diminution in potency when kept at 0–4°C for this period. With the object of producing a sterile vaccine capable of immunising against smallpox when injected intracutaneously, Dr. D. McClean has adapted a strain of vaccinia to grow readily in the dermis, and is investigating the behaviour of this strain when propagated in eggs.

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In the field of bacterial cytology, Mrs. E. Klieneberger-Nobel, D.SC., after studying the origin of the L-forms in bacterial cultures with some of the newer cytological methods, has abandoned the symbiosis theory and has formed the new conception that bacteria exist in an A-stage (bacterial stage) and an L-stage (pleomorphic, amorphous stage).

Continuing their work on dextran, Dr. W. d'A. Maycock and Miss S. J. L. Spooner have found that in rabbits into which 9 g. per kg. body-weight was injected, all tissues examined contained this substance up to eight weeks later; while after sixteen weeks it was still detectable in the brain, bone-marrow, and skin.

In collaboration with Dr. R. Grubb (Sweden), Mr. W. T. J. Morgan, D.SC., F.R.S., has examined the reactivity of human erythrocytes and secretions with an antiserum specific for a new blood-group character known as "Lewis." The so-called "Lewis-positive" character of a blood is intimately correlated with the secretor-nonsecretor status within the ABO classification, "Lewis-positive" adults being nonsecretors. The Medical Research Council's blood-groups studies unit, under the direction of Dr. R. R. Race, has confirmed that the "Lewis-positive" blood-group, in adults, depends, unlike all other known blood-groups, on a recessive gene.

In further observations on the effects of ultrasonic vibrations, Mr. C. J. B. Bradish, PH.D., has established that ultrasonic irradiation at frequencies of 500–1000 KC/S at 1–6 watts/ml. solution, in the presence of an air interface, produces no significant change in the sedimentation behaviour of egg albumin, human serum-proteins, and human carboxyhæmoglobin; the electrophoretic behaviour of human serum-proteins is similarly unaffected. A slight coagulation of all proteins occurs during irradiation, without change in the properties of the proteins remaining in solution. Studies with viable organisms, especially *Trichomonas fœtus*, indicate susceptibility to ultrasonic irradiation, attributable to the fractional forces arising when the biological unit is too large (15 μ) to follow the motion of the medium. Units smaller than 0·5 μ follow the motion of the medium completely, and any modification in properties in them occurs as a result of the numerous sequelæ of cavitation.

In the section of the report dealing with the work of the blood products research unit, it is noted that plasma fractionation products may now be dried in ampoules which allow glass-sealing after they have been nitrogen-packed; this should prevent the deterioration of the proteins by moisture.

Miss E. M. Hume, and her colleagues, continuing their work on vitamin A in relation to the stomach, report that in some patients with peptic ulceration treated with the vitamin healing of the ulcer has been demonstrated radiographically; continuous treatment for 6–10 weeks appears to give the most satisfactory results.

The Wider World

GREEK PEASANT REMEDIES

T. STEPHANIDES
M.D. Paris, D.M.R.D.

PEASANT remedies of all countries are interesting not only as examples of ancient folk-lore surviving to this day but also because there is often the possibility that they may contain something useful.

In places where doctors are few and far between, the inhabitants have acquired some degree of empirical skill in treating themselves in illness or accident, and, though much chaff may be mixed with their wheat, the wheat itself, when winnowed, may merit attention. It was the Peruvian Indians, for instance, who first discovered that cinchona bark was a specific for malaria.

While travelling for some years in various parts of Greece I collected a fair number of popular "prescriptions," mostly herbal remedies whose ingredients were described or shown to me, and, owing to some knowledge of botany, I was generally able to identify the plants concerned.

In some cases I observed the satisfactory results of the remedies or tried them on myself. More often, however, I did not remain long enough in one spot to verify the results personally, and can only say that the remedies were held in high repute locally and that I spoke to people who claimed to have been cured or benefited by them.

Most of my notes were unfortunately destroyed during the war, but the few examples given in this paper may perhaps be of interest. A chemical analysis of some of the plants mentioned, if this has not already been done, might yield results of practical value.

ABRASIONS, LACERATIONS, AND WOUNDS

(1) The wound is washed out with a decoction of the green cones of the common cypress tree (*Cupressus sempervirens* L.). Compresses soaked in the same liquid are also applied to the injured part.

(2) Leaves of the common cherry-tree are boiled in wine until soft, placed directly on the wound, and kept in place with a bandage.

(3) Equal parts by weight of indigo powder, hyssop leaves (*Hyssopus officinalis* L.), and leaves and bark of the local juniper-tree (*Juniperus phœnicea* L.) are boiled together. The liquid thus obtained is strained and mixed into a thick paste with the calcined and finely pulverised shell of the common Balkan land-tortoise (*Testudo græca* L.). This paste is spread directly on the affected part and, in some parts of Macedonia, is said to be particularly efficacious in clearing festering wounds.

(Sometimes the juniper is replaced by leaves and bark of the common elm, *Ulmus campestris* L.)

HÆMORRHAGE

(1) For all forms of hæmorrhage, including epistaxis, menorrhagia, and hæmophilia, the eggs of the common octopus (*Octopus vulgaris* Lam.) are prescribed. These are roasted, ground into powder, and taken internally as a decoction, 100 ml. being the average daily dose.

(2) Three parts by weight of pear-tree root shavings and one part of fragments of the outer skin of the onion are boiled in wine, and 2–6 glasses taken during the day.

(3) Cobwebs and shredded tobacco from a cigarette are also used for staunching the flow from a bleeding wound, but these two practices are more or less world-wide.

INSECT STINGS

Bee, Wasp, and Hornet Stings.—An onion or a head of garlic is cut in half and rubbed on the spot. Garlic is very effective, even with hornet stings, as I have observed by personal experience.

Scorpion Stings.—A live scorpion is dropped into a small bottle containing about 50 ml. of olive oil. The scorpion dies immediately and, in a few months, is dissolved more or less completely except for the chitinous portions. This oil is kept for emergencies, and a small amount rubbed into the stung part is said to relieve the pain in a few minutes.

SKIN AFFECTIONS

Dermatitis, Furunculosis, &c.—Fresh leaves of the black elder (*Sambucus nigra* L.) are pounded in a mortar and applied to the affected part. Sometimes the pounded leaves are mixed with boiled mutton-fat. I myself saw this remedy give excellent results in four cases of an undiagnosed dermatitis with large purulent collections under the skin. These all cleared in two or three weeks though they had resisted more orthodox treatments.

Sores.—For sores and infected wounds, the peasants of some parts of Macedonia cut a slice from the outside of a hard white cheese, called *phaita*, which develops a kind of greenish mould. This slice is placed, mouldy side downwards, on the affected part and held in place for several days with a bandage. (Is this a primitive ancestor of penicillin?)

Warts.—These are said to disappear if touched every day for a week with the milky sap of the ordinary fig-tree or of the spurges *Euphorbia sibthorpii* Boiss. and *E. myrsinites* L. (The seeds of *E. myrsinites* were

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used medicinally by the ancient Greeks, according to Theophrastus.)

Acne.—Iron nails are left in a jar of water until rusty. A glass of this water is taken three times a day.

Erysipelas.—A few finely pulverised crystals of copper sulphate are shaken up in a bottle with a few ml. of alcohol. This liquid is applied to the affected part.

Ringworm of Scalp.—Equal parts by weight of gunpowder, saltpetre, brick-dust, and fresh cowdung are mixed into a thick paste, which is plastered all over the patient's head. A cotton skull-cap is worn over all, and the mixture is kept on for a week or longer before being washed off with ordinary soap and hot water.

Scurf and Seborrhœa of Scalp.—A few dried fig-leaves are pulverised and beaten up with the yoke of an egg. This is rubbed well into the scalp, left for half an hour, and then washed out with soap and hot water. The treatment is repeated from once a week to once a fortnight at the beginning, and finally once a month.

MALARIA

(1) *Quinine.*—The virtues of quinine are recognised by the peasantry. In some places its effects are supposed to be strengthened if the powdered drug is taken in a little urine from a calf or an unweaned baby.

(2) *Pharmakouli.*—A decoction of a plant called *pharmakouli*—i.e., "little medicine"—is said to give excellent results. The plant generally preferred is *Erythræa centaurium* Pers., but *E. latifolia* Bois. is also used and is known by the same name.

(3) *Lemon Pips.*—Twenty or thirty lemon pips are roasted and prepared like black coffee; the peasants particularly insist that the slippery outer coating of the pip should not be removed. Two small coffee-cupfuls of this liquid are taken first thing in the morning at least an hour before breakfast.

(4) *Red Chillies.*—In Macedonia a small pointed variety, about 5 cm. long, of the chilli *Capsicum annuum* L. is grown. One ripe pod a day, eaten an hour before breakfast, is said to ward off malaria. (Several ripe pods soaked in water and left in the sun for five or six days are reputed to be excellent for eczema and other skin diseases and for infected wounds, including gangrene. They are made into a paste and applied externally.)

(5) Equal parts by weight of capers, cloves, and apple-tree bark are boiled in twice their weight of wine until the whole is reduced to half its original total weight. Half a soup-spoonful is given every day an hour before breakfast.

DISEASES OF DIGESTIVE SYSTEM

Toothache.—A clove is pulverised and applied to the painful tooth on a piece of cotton-wool. Oil of cloves is also used when obtainable.

Indigestion.—A decoction of mint leaves and flowers (generally *Mentha silvestris* F. or *M. piperita* L.) mixed with orange blossom is taken hot, with or without a little sugar.

Jaundice.—Several handfuls of parsley leaves are boiled in water, and a glass of this liquid is taken three times a day.

Diarrhœa.—A fig-leaf, dried and pulverised, is taken in a glass of water. The yoke of an egg is mixed with six teaspoonfuls of coffee (roasted and reduced to powder). This is moulded into pills, of which 3–6 are taken a day.

Dysentery.—About 50 ml. of beetroot juice is poured into a small bottle and placed in the centre of an uncooked loaf of bread, which is then baked in the ordinary way. A dessertspoonful of this liquid is taken every half hour. Alternatively two bedbugs, fresh or dried, are made up into a bread pill; 3–6 of these pills, taken at hourly intervals, are said to cure any attack of dysentery. It is a curious coincidence that in Annam and Tonkin 3–6 dried bedbugs are reputed to be an infallible snake-bite antidote. The disgusting odour of the bedbug may possibly be due to some compound having medicinal properties.

Constipation.—The tassels of a dozen ears of maize (*Zea mays* L.) are boiled in water, and a glassful of the liquid is taken night and morning.

Hæmorrhoids.—Three or four large onions are cut into pieces and boiled for about half an hour in $1^1/_2$ litres of water. This liquid is poured into a chamber-pot; the patient then seats himself on it and gets as near as he can to the hot vapour without scalding himself. Fomentations made with the warm liquid are afterwards applied to the hæmorrhoids.

DISEASES OF RESPIRATORY SYSTEM

Coughs, Colds, Sore Throat, &c.—A decoction of dried mallow flowers, usually *Malva silvestris* L. or *M. rotundifolia* L., is given as hot drinks or gargles. For sore throat equal parts (about 50 ml.) of vinegar and honey are mixed with half a teaspoonful of salt and boiled. This is used as a warm gargle, and is also said to relieve toothache.

Asthma.—A concentrated decoction of *Sambucus nigra* L. (or *Ulmus campestris* L.) is beaten up with the yoke of an egg and taken as a hot drink.

Pulmonary Tuberculosis.—A decoction of the rhizome of *Ruscus hypoglossum* L., taken as a hot drink three times a day, is believed in the Ionian Islands to be a cure for pulmonary tuberculosis. In Northern Greece two or three glasses a day of fermented wheat bran in water is often given to tuberculous patients.

DISEASES OF GENITO-URINARY SYSTEM

Dysuria and Nephritis.—A decoction of the fresh leaves and roots of the plantain *Plantago coronopus* L. is reputed to be an excellent diuretic. I have tried this myself and found it decidedly effective, though how far autosuggestion helped with the result is difficult to assess. On several occasions after trying this remedy I also passed abundant uric acid crystals. For dysuria alone about 200 g. of hempseed is roasted in a pan and then pounded in a mortar. This is then steeped for 24 hours in about $1^1/_2$ litres of water and strained. Half a glassful of the strained liquid is taken night and morning. For nephritis alone a decoction of the seeds of *Juniperus phœnicea* L. (or *J. oxycedrus* L.) in water is strained through several thicknesses of muslin. Half a glass of this liquid is taken three times a day.

Nephrolithiasis.—A decoction of parsley leaves and roots is supposed to dissolve small kidney stones. A glass of this liquid is taken night and morning.

Orchitis.—A dried root of *Dracunculus vulgaris* Schott. is pulverised and made into a paste with olive oil and milk. This is spread on a piece of muslin and applied to the affected part.

Dysmenorrhœa.—Equal parts by weight (about 200 g.) of unwashed sheep's wool, maidenhair fern (*Adiantum capillus-veneris* L.), horsetail (*Equisetum maximum* Lam.), bark of mulberry (*Morus nigra* L.), and root of blackberry (*Rubus fruticosus* L.). To this is added half the amount (about 100 g.) of the outer skin of an onion, and two or three green cypress cones. The whole is boiled and strained, and half a glass of the liquid taken every morning.

Leucorrhœa.—A decoction is made of equal parts by weight of celery (*Apium graveolens* L.) stems and leaves, roots of the reed *Arundo donax* L., and sugar. One or two glasses of this liquid is taken daily. Hot fomentations made with the same mixture (minus the sugar) are applied to the vulva.

Chronic Gonorrhœa.—Three parts by weight of sea water are mixed with one part of ass's milk. Three glasses of this liquid are taken daily, the juice of half a lemon being added to each glass. Alternatively equal parts by weight of wood-tar, shavings of *Juniperus phœnicea* L. bark (or of *J. oxycedrus* L., according to some), and seeds of the same are pounded together in a mortar and made into pills, of which 3–6 are taken daily.

Syphilis.—A decoction is made of equal parts by weight of roots of *Asparagus acutifolius* L., roots of the egg-plant (*Solanum melongena* L.) and bark of the Aleppo pine (*Pinus halepensis* Mill.). The liquid is strained off and one glassful taken every morning.

MISCELLANEOUS DISEASES

Arthritis.—Poultices of wood ash are applied to the affected part. Alternatively equal parts (about 100 ml. of each) of turpentine, olive oil, and vinegar are beaten up with two egg yokes and one dessertspoonful of salt. This mixture is warmed and applied to the affected part.

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Earache.—A piece of the silk "beard" of the pinna shell (*Pinna nobilis* L.) is placed in the affected ear.

Headache.—A glass of a decoction of quince pips in water is supposed to relieve a headache very quickly.

Conjunctivitis, &c.—The eye is bathed with fresh urine from a cow. Alternatively fresh vine leaves are pounded in a mortar and placed as a compress on the eye.

Mumps and Other Swellings.—A poultice of boiled artichoke heads pounded in a mortar is applied to the affected place.

"*Cancer.*"—In many parts of the Greek countryside watercress (*Nasturtium officinale* R.Br.) is considered an excellent remedy for any form of "cancer." It is given in large quantities, raw or as decoctions, to patients with any disease that can be covered by that somewhat elastic diagnosis.

USE OF COWDUNG

In 1917 I was sent to Isvor, in Greek Macedonia, to attend a course. Isvor occasionally came under long-range enemy fire, and I was called one day to give first-aid to a peasant wounded in the abdomen by a shell splinter. At that time I had not yet begun my medical studies, but I knew some anatomy.

The victim, a man of about 40, had received a horizontal gash, a hand's breadth or more long, just below the navel. The peritoneal cavity had been penetrated, and several intestinal loops were protruding from the wound. The patient had been wounded just outside a cowshed, and some bystanders had tried to prevent the protrusion of the intestines by placing a heavy sack of fresh cow manure across the patient's abdomen.

When I arrived, the wound and the intestines were soaking in liquid cow manure, which had seeped through the sack. I did not waste time trying to clean the patient (nor would I have known how), but I just clapped on a pad and a compressive bandage and had him carried on an improvised stretcher to a nearby French field-ambulance. After a quick examination, the surgeon in charge told me that there was no hope for the patient, since the peritoneal cavity was full of liquid cowdung. A fortnight later, however, when I left Isvor on the completion of my course, the patient was still alive. In fact he appeared to be doing very well, to the complete amazement of the medical staff.

I passed through Isvor about three months later and found the patient completely recovered and going about his ordinary work. The wound scar appeared to be well healed, and he only complained of a slight tenderness of the abdominal wall and some weakness on exertion.

About twenty years later I mentioned this episode to Dr. T. Sordina, director and chief-surgeon of the Corfu Municipal Hospital. He told me that he knew of a very similar occurrence.

A few years before, he had been called out to one of the Corfu villages to attend a peasant gored by a bull. The wound was in the abdomen and, since the accident had taken place in a cowshed, the bystanders had adopted the same expedient of putting a sack of cow manure on the victim's stomach to keep in the intestines. The intestines had not been pierced, but the peritoneal cavity was swimming in liquid manure. Dr. Sordina took the necessary surgical steps but had little hope of saving the patient's life. To his surprise, however, the patient made an uneventful recovery and was still alive and well several years later.

These two parallel cases were surprising enough, but I might have put them down to chance had I not heard at about the same time that it is a common practice among the peasantry of some parts of Spain to treat puerperal fever by filling the patient's vagina with fresh cowdung. My informant, who knew Spain well, assured me that this treatment seemed to be efficacious, though he could not give me any definite facts or figures.

When it is remembered that in India cowdung is regarded as a potent remedy against many diseases, it seems that this subject might repay fuller investigation. Antibiotics have been extracted from the soil and from various moulds; it is not impossible that they could be isolated also from cowdung, with its vast and little-known micro-organic fauna and flora.

In England Now

A Running Commentary by Peripatetic Correspondents

ONE goes to the United States, as one goes to school, to learn and be taught; one goes to Italy, as one goes to the university, to be educated. For three hundred years Rome played a central part in the education of Englishmen; so the mental attitudes (and, let it be written without shame, the excitement) of the middle-aged visitor to Rome are of necessity derivative; but when the scraps of half-forgotten schoolboy learning have been awakened by the ruins of the Forum and the palaces of the dead Caesars, when the miraculous spectacle of Renaissance art has fatigued a sensorium unaccustomed to beauty, when the mind has stumbled over the long journey from the Catacombs to the Vatican wireless-station, then the questions which Rome propounds demand an individual answer. Why and whither?

To the first question, addressed to him on October 15, 1764, as he sat musing in the church of the Franciscan friars, Edward Gibbon resolved to supply an answer; yet in May, 1860, Henry Adams sitting in the sunset on the steps of the same church wondered that "not an inch had been gained by Gibbon towards explaining the Fall!" The twentieth-century scientific ignoramus sits on the same evocative steps in the hope that the inspiration of these learned men may be communicated to him; but, like a lizard on a rock, he is overcome by inertia in the heat, his only emotion one of relief that the white and elephantine memorial to Victor Emmanuel is at last out of sight. He slumbers between the monuments of two dead civilisations—monuments to power, to faith, and to beauty. As the evening cools the sleeping and sedentary disciple realises, with a start, that the value of the moment lies in the questions posed and not in the answers given, conditioned by inadequate experience and by fumbling cerebration as these must be. Not since he was an undergraduate has he heard such insistent questioning. Why and whither? There was a time, more recent and still remembered, when he shared the modern need to ask the question "How?" until at last he fell back from a mountain of discovered and unrelated fact, dispirited and defeated. The natural escape from this decline was into a Nordic phase of activity—from questing beast to worker-bee—a ceaseless round from ward to committee, from consulting-room to bedside, and then, all questions dulled, to sleep. But now, sitting in the Roman sunshine, why and whither? Too late to give an intelligent answer oneself, too late to do more than warn the young man, before he obeys the modern injunction to "go west," that he must first achieve a synthesis, between education and learning, between wisdom and knowledge, between contemplation and activity, between the spirit and the corpus—in short, between Rome and New York.

* * *

We are a cosmopolitan collection at our military hospital—two Irish, three Scots, two Welsh, a Central European who has adopted an Oxford accent and British citizenship, and a few English to fill the gaps. The mixture helps to relieve the monotony of occupying Germany, for with small numbers of healthy troops it is certainly monotonous from the medical point of view. Our Welsh—not the Scots strangely enough—are expert bargainers in a country where many of the good things are still only to be obtained by mutually satisfying barter; our convert to British nationality looks after the cuisine in a way only possible to a much travelled Continental of rare good taste. One Scot looks after our housing problems and an Irishman the accounts, and this distribution of labour has prompted a cynical Celt to ask: "The English, are they necessary?"

Outside the confines of the hospital wards riding and "swanning" are the chief activities other than the leisurely pursuit of snooker balls. Our swanning has not been on a grandiose scale, but most of us have managed by some means or other to tour much of the Rhine. We do not of course equal our non-medical colleagues, who think nothing of consecutive weekends in Denmark and Italy or a couple of nights in Paris over the Easter holiday.

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Our work is not onerous. The surgery consists mainly of hernias, varicose veins, and minor repairs. Trauma, the result of break-neck driving over poorly surfaced and ill-designed roads, is all too frequent and in many cases the province of the pathologist rather than the surgeon. Medicine is tonsillitis, influenza, infective hepatitis, and functional gastritis which is usually the result of separation, anxiety, or fear such as that of V.D. Outside the hospital the regimental M.O. is no more busy, though he has the added cares of sanitation and personal hygiene on his hands. It is not surprising therefore that we all get bored and fretful, like children who have lost their toys; but adjustment eventually comes, and though those departing express no regret there is sometimes a wistful look in their eye as they leave the good things of Army life to battle once more with the realities of civilian Britain.

* * *

Since book-burning was removed from the schedule of Pierpoint's duties few threats more awful to the pen-happy author have appeared than that implied in a circular which I, and I suppose all other members, have received from the Society for Experimental Theology. You must know that no book occupies a more honoured place on the theologian's bookshelf than the *Manual of Determinative Hagiology*. I admit that in readability it bears the same relation to even the dullest textbook that Bradshaw bears to a work of voluptuous fiction. Small mass and a moderate 8vo. format make it useless as a doorstop or writing-pad, but wedged between Dean Hole (on roses) and Dean Inge (on gloom) it looks well in shining blue and gold. Now this circular asks us experimental theologians if we like the book; and if not, why not. I can assure you, Mr. Editor, that I shall be the last to leave your side in the losing battle for anonymous reviewing, but it never entered my head that an author might risk running the gauntlet rather than private chastisement. The idea will no doubt spread, and I am waiting to see the comments of the punters of England on my favourite bedside annual, *Ruff's Guide to the Turf*.

* * *

The other day I was at a medical students' smoking concert, and I was sorry to learn that the good old songs are dying out, and the words and tunes are no longer known. A Medical Folk-song Society should be formed to preserve our heritage. I do not mean that we should preserve songs such as "The Ball of Kirriemuir" and "The Bastard King of England," which are sung in Army messes and at other non-medical gatherings, but the essentially medical songs. How can the modern student know anything about obstetrics if he does not sing to the tune of "Tavern in the Town":

> Bear down, Mrs. Brown, Mrs. Brown,
> We have two fingers on the crown, on the crown,
> And soon you'll have a bouncing baby boy,
> Bear down, Mrs. Brown, Mrs. Brown.

A few medical schools have books in which the words and music are written down, and I understand that one collection was thought to be so valuable that at the beginning of the war it was flown to Canada for safe keeping, but I feel that there should be a national collection and that the songs should be recorded. Anybody who has heard a record of Peter Pears singing that old Suffolk folk song about the bachelor weaver (H.M.V. DA1873) will agree that he is the natural choice as a singer, and more particularly if Benjamin Britten can be induced to set the airs.

* * *

The old man I brought in from Chilamanzi with ulceration around the umbilicus turns out to be something I have looked for in vain for several years—a case of amœbic ulceration of the skin. I took a smear from the grumous watery material, with yellow flecks, in the base of the ulcer, mixed it with tap-water, and there was an amœba stuffed full of red cells, like a 'Cellophane' bag crammed with sovereigns. It seemed almost too distended to move, but deferred to my enthusiasm by lackadaisically projecting a pseudopodium as I looked at it.

Letters to the Editor

THE NEIGHBOURS' CHILDREN

SIR,—Having read the letter from "Pro Juventute" (June 4), I wonder whether his spirit of inquiry would lead him to discover how many of the neighbours' children have been the victims of the "let-the-baby-cry" policy advocated without exception by midwives and nursing-homes and pursued by so many mothers in spite of their own better feelings. Is there one child among those he describes whose needs have been considered before the convenience of adults?

It would be interesting to know more about Pro Juventute's own child and why he thinks she is happy—a difficult thing to decide. For instance, the fact that a child does not cry may mean that she cannot cry, and what can be more unhappy than this?

On what grounds does Dr. Chapman (June 11) justify using force against a child? Force and the fear of force may distort character, but it certainly does not form it. There is much evidence in this country district of the liars and thieves it produces and of what little Hitlers and Mussolinis the children become in their relations with their playfellows.

The modern child is subjected to a forcing process, politely called character-training, from the moment of his birth. He is forced to cry, though he may be already breathing quietly; he is forced away from his mother, though he likes her company and she likes his; he is forced to take his feeds in twenty minutes at four-hourly intervals and to sleep for eight hours at night, though he prefers twenty-five minutes every three hours and to sleep ten hours at night; he is forced to sit and be bored in a pram when he wants to crawl and find out about things; he is forced to play with silly toys in a wooden cage when he should be getting on with his education in the garden; he is forced to sleep, often to lie awake, in another wooden cage out of sight and out of earshot.

Each item of this process, chiefly applied by mothers, can kill the child, and short of this what misery is caused, and how normal development is hindered, until the child tries to get his own back in one way or another, and is forced to attend a child-guidance clinic.

It is difficult to believe that a more complicated cage is now recommended by the highest authority. Babies are now to be shut in by wire netting like the chickens, until one of them discovers that this too can be used as a lethal weapon. These accidents will go on happening until children are looked after by human beings instead of by mechanical devices.

We talk of freedom, even fight and die for it, but we deny it to our children, though its price is only unceasing vigilance.

Three Mile Cross, Reading. S. M. HALLIDAY.

SYSTOLIC MURMURS

SIR,—Your correspondent, H. C. B. (April 2), mentions an interesting point of stethoscopic technique for use in distinguishing functional from organic systolic murmurs. "Firm pressure of the stethoscope against the chest wall," he writes, "will cause a functional murmur to disappear, whereas an organic murmur is unaffected."

This is indeed what often happens, but I fancy that H. C. B. has misunderstood the reason why it happens. A functional systolic murmur may disappear under firm pressure from the stethoscope, but not because it is functional.

Too little is said or written about the acoustic properties of the stethoscope, and in consequence it is rare to find a medical student who has been taught to get the best out of his instrument. The analogy which is found most acceptable and intelligible is that of the kettle-drum. It is a familiar sight to see the orchestral tympanist stoop over his drums and manipulate the handles round the edge. He is altering the pitch of the drum by tightening or loosening the vellum stretched over the drum-head; tighter for higher pitches, looser for lower pitches.

The skin of the chest stretched over the bell of the stethoscope is comparable with the vellum stretched

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over the drum-head. The skin vibrates as it transmits heart-sounds and murmurs. With firmer pressure it is tightened, the pitch of the instrument is raised, and murmurs of higher frequency—for example, the short diastolic murmur of early aortic incompetence—are heard at their best. With gentle application of the chest-piece, just sufficient to make a soundproof contact with the skin, the stethoscope is tuned for lower pitches; apical third heart-sounds and the rumbling mid-diastolic murmurs of mitral stenosis become audible. Nothing is easier than to cut out the frequency of this murmur by too firm pressure over the apex beat; this is one of the reasons why mitral stenosis is missed in its early stages.

With firmer pressure H. C. B.'s functional murmurs may disappear, but only if their pitch is such that its frequencies are cut out by this technique.

Anybody who is unfamiliar with these points may prove them for himself without difficulty. There is very little information on the subject in any of the standard books on clinical methods and diagnosis. I believe that the diaphragmatic stethoscope has positive disadvantages because its receptivity is fixed and not adaptable for the appreciation of different pitches.

St. George's Hospital, London. J. M. LIPSCOMB.

SENSITIVITY TO LIVER

SIR,—Severe reactions following injections of liver extract are not very common, and the patients can usually be desensitised without much difficulty. We have, however, encountered one case of typical pernicious anæmia in which reactions to injections of liver were so severe that for a time treatment had to be carried on by the oral route.

The patient, a woman of 39, had had pernicious anæmia for some five years. The first injections of liver, which were given weekly, were followed by moderate itching, but the first severe reaction occurred after treatment had been continued for about four years, although this was not sufficiently severe to perturb the patient or her doctor (T. Y. B.). Then towards the middle of 1948, an injection of liver produced a terrifying reaction consisting of severe and immediate vomiting, tachycardia, flushing, fall of blood-pressure, a feeling of impending death, and collapse so severe as to necessitate intravenous injection of nikethamide with 5 minims of adrenaline solution (1 in 1000) which had to be repeated in a quarter of an hour. Equally severe reactions occurred with every brand of liver extract that was tried and therefore a further opinion was sought (A. P.).

Even when only 0·1 ml. of liver extract was injected intradermally a large urticarial weal resulted; and injection of 0·2 ml. a quarter of an hour later produced generalised flushing and slight shivering. Treatment was therefore continued with proteolysed liver by mouth, but this unfortunately did not cause her red corpuscles to rise to 5,000,000 per c.mm. and another attempt was made to treat her by injections of liver extract. She was given 2 tablets (0·1 g.) of 'Anthisan' half an hour before the injection of liver extract was due, followed by an injection of anthisan (0·05 g.) a quarter of an hour later. She was then given 4 ml. of liver extract intramuscularly, and this was followed by such severe allergic reaction that adrenaline had to be given. Even this did not cut short the attack of flushing, palpitation, &c., which to some extent persisted until the next day.

It was clear therefore that treatment would have to be continued by mouth; and large quantities of proteolysed liver were taken for some months, by which time the red corpuscles had risen only to 4,120,000 per c.mm., while the patient was nauseated by the sight of the proteolysed liver. By the courtesy of British Drug Houses Ltd. one of us (A. P.) obtained some vitamin B_{12}, of which 20 μg. was injected. There was no reaction of any kind, and three further injections given by one of us (T. Y. B.) have caused no discomfort, while the general condition has improved and the slight neurological abnormalities have almost disappeared.

As vitamin B_{12} is extremely difficult to obtain, we would emphasise that its use should be confined to the rare cases of extreme sensitivity to the proteins of liver extract as in our patient; the small amounts available should not be wasted on cases that can be treated equally well with ordinary liver extract.

London, W.1. A. PINEY.
Weybridge. T. Y. BARKLEY.

ADMINISTRATION OF HEALTH CENTRES

SIR,—A health centre as normally pictured will provide both for general-practitioner services and for the services of the local health authority; in addition the regional hospital board may provide certain facilities. The problems of administration will vary with the functions of the centre.

It is laid down that the general practitioners will be charged rent for the use of the centre. The rent could be charged as an economic recovery of interest and capital on the initial outlay for building and equipment and for the cost of staffing, upkeep, and depreciation; but with wages and building costs at their present level this would probably be impracticable, and some smaller assessment would have to be made. It does not seem fair that rents should differ in different parts of the country, though it may be argued that health centres may not all provide equal facilities. A problem peculiar to each centre is the method of division of the total rental for the health centre between the members of the group working there. Some may claim that the rent should be equal, while others may suggest a rent in proportion to the size of the doctor's list or the number of sessions he works a week. There is no standard number of surgeries to be held per week, nor can there be. Again, the amount of minor surgery and similar procedures varies according to the doctor.

The health centre should provide certain basic equipment for its consulting-rooms, such as a desk, chairs, an examination-couch, and a small instrument trolley; and there should be a full electric installation, with plugs to connect to the doctors' own equipment. All instruments and professional items should be provided by the doctor according to his tastes and need. The health centre would provide towels and a laundry service if gowns or white coats are worn. Doctors would have individual consulting-rooms except that, by arrangement, partners could share a consulting-room.

If there is a theatre for minor operations, a method must be worked out for meeting the cost of dressings, of plaster bandages, of sutures and the like, and of the upkeep of the anæsthetic apparatus. In a busy centre for multiple practice there is place for a room where a nurse may renew dressings and remove stitches to save the doctor's time. If half a dozen doctors are seeing patients simultaneously, then there is probably work for two nurses; and then the dressings-room can be expanded to a waiting-room with three or four cubicles so that patients of both sexes can be accepted in privacy and without delay.

With all this there must be no suggestion of a hospital outpatient department. Communal waiting-rooms should be avoided, and if individual waiting-rooms cannot be arranged for each doctor a common waiting-room should be shared by the patients of two doctors.

A clerical staff is necessary. This should be in two sections—one for the general-practitioner service and the other for the local-authority work. In this way a clear division of duty can be made and the general practitioner assured that the work on his correspondence and records will not suffer by the diversion of the staff to other duties. A reception clerk would deal with inquiries and direct patients to the various departments. For records each doctor should at first be given standard filing-cabinets, and his records and correspondence should be kept in his consulting-room. The communal use of a general office could be considered later when experience has indicated the most convenient solution. The centre would have its own internal telephone exchange, and the doctor would probably be expected to pay only for trunk calls. Initially the staff could consist of a receptionist-telephonist and a full-time shorthand-typist with experience of filing. Additional staff could be taken on later as the demand appeared. As the centre would have peak-loads of activity at the normal surgery hours, any extra clerical help could be part-time to meet the local need. This arrangement would be convenient in many ways as there are always young housewives with clerical experience who would welcome work for an hour or two a day. It is anticipated that the staff would be recruited and paid for by the local health authority, and that a proportion of the expense involved would be included in the rental.

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Arising from this is the question of the elaboration of the general-practitioner services at the centre. Is the scheme to be merely for a suite of multiple surgeries with a minor operating-theatre or are other services to be provided and staffed by medical auxiliaries? At what level is the limit to be drawn? Is a group of doctors justified in asking for an X-ray installation, for a physiotherapy unit, or for a laboratory? Can they be considered competent to interpret every X-ray film, to supervise accurately the work of the physiotherapist, and to select the various investigations which a clinical laboratory can perform other than blood-counts, urine analyses, and investigation of sputum, of pus, or of throat-swabs? Are these within the province of the general practitioner or of the specialist, bearing in mind that a health centre will normally serve an urban community?

It is assumed that, in accordance with normal local-government procedure, the centre would be administered by a health-centre subcommittee of the health committee of the county borough or county council concerned. Representatives of the general practitioners working at the centre would be coöpted on to the subcommittee. The day-to-day administration of the building and the lay staff would be the responsibility of the medical officer of health, who would be in a position to maintain the amenities provided for his colleagues in clinical practice by an appreciation of their needs.

It is to be hoped that interest can be stimulated and that a free exchange of views will take place between general practitioners and the staffs of local authorities and of regional hospital boards. Only by such coöperation will success be achieved.

Brighton. W. S. PARKER.

MIND AND MECHANISM

SIR,—Many years ago Sir Michael Foster likened the electrical stimulation of the cortex cerebri to playing the piano with a broomstick. Even those crude methods elicited *some* form of localisation there. More refined technique, ablation experiments, and so on at the hands of Sherrington, Penfield, Lashley, and others, combined with clinical experience have revealed a plastic representation in the cortex very different from the early crude ideas of localisation. (The subject is well discussed in F. M. R. Walshe's *Critical Studies in Neurology*.) In those early days the functions of the spinal cord seemed to be explained by simple and compound reflexes; and if Babbage had succeeded in elaborating his ideas of the calculating machine and had produced a modern electronic computing machine the latter would have been regarded as a finer machine than Nature's spinal cord. In this case, however, Sherrington forestalled the machine; but it is not surprising that, as the analogy between the integrative action of the nervous system and the integrating machine is so close, even among scientists, there is danger, as Professor Jefferson says, "of anthropomorphising the machine." The brilliant young psychologist referred to by Professor Jefferson, K. J. W. Craik, had already begun in his philosophical writings to apply the analogy of the integrating machine to higher mental functions before his untimely death.

However great the danger may be of anthropomorphising the machine we must face the fact that more and more physiological processes are being brought under the ægis of biochemistry. The greatest physiologist of the day has no difficulty in accepting the overwhelming importance of physical processes in his *Man on his Nature*. It is only when he gets to the crucial task of dealing with body and mind that the argument falters. He is not content to say with Hughlings Jackson "what is psychologically consciousness is physically an adjustment of the organism to its environment"—whatever that profound remark means!—but prefers to "wait and see."

We may accept in the present state of knowledge Professor Jefferson's conclusion that "no mechanism could feel (and not merely artificially signal) pleasure at its successes," &c.; though similar apparently axiomatic generalisations have so often in the past proved ultimately untrue. At any rate at present we have to accept it as an axiom, and, that being so, Professor Jefferson has, I think, emphasised the all-important point when he says that "*thinking is so saturated with emotion that one does not exist without the other.*"

Psychologists in the past have paid lip-service to "affective tone": they have often forgotten it in the rarified atmosphere of pseudoscientific sociology, with the creation of such imaginary monstrosities as the "economic" and the "ethical" man! Yet it is in the domain of sociology that emotion has been most exploited, and with most fruitful results—Le Bon's book on *The Crowd* marked an epoch, and Trotter's *Instincts of the Herd in Peace and War* further elaborated the theme and showed its importance in everyday conditions, other than the grosser forms of mass hysteria. Trotter's book had immense influence since it came at a time of social upheaval. McDougall's *Introduction to Social Psychology* also caught the attention of the public.

The all-pervading influence of emotion in the individual received scant notice. It is Freud's great achievement to have disinterred the buried emotions of the individual and demonstrated their colossal driving force—but unfortunately no man has been worse served by his disciples.

From the present point of view, however, I think that the work of Henry Head and Rivers has been unduly neglected. Neurologists have spent too much time and energy in criticising that part of their theory which deals with peripheral cutaneous nerves. Walshe's devastating criticisms apparently meet with the approval of most neurologists. I think that both Head and Rivers were led by their enthusiasm to make somewhat flamboyant statements—e.g., two-point discrimination travelling up tracts of the cord, and so on—which obscured their real meaning. It is their fundamental hypothesis of the coexistence of two systems—one dyscritic (protopathic), the other epicritic—which is most valuable and which has been obscured and neglected through controversy.

All biologists agree that phylogenetically, as a general rule, evolution proceeds from the less to the more differentiated—i.e., from the dyscritic to the epicritic. Walshe, in saying that "all we have learned of the evolution of the nervous system encourages us to think that the elaboration and refinement of nervous function has been attained, *not by any multiplication of peripheral organs*, but by increasing differentiation and integration of function in the central nervous organ," is confining his attention too closely to the fully developed human nervous system. The differentiation and multiplication of peripheral organs, resulting inter alia in the evolution of the special senses, occurred long before—or at any rate pari passu with—the development of the central organ. The special senses, for example, have not, however, all developed at the same rate, but at different rates in different species; and in any given species those which have least developed persist and continue to function at a retarded stage of differentiation. (It does not follow that the lower stage remains entirely unchanged in the new environment.) Whilst *all* these so-called "senses" retain some measure of affective tone, those which persist least differentiated exhibit most emotional content of the powerful, but vague and ill-defined (dyscritic), character of the earlier phylogenetic stage. It would seem that the affective tone of the more differentiated (epicritic) "senses" themselves undergoes differentiation of the type called "sublimation" by the Freudians.

But, as Professor Jefferson says, "thinking is so saturated with emotion that one does not exist without the other." In Trotter's masterly essay "Has Intellect a Function?" he too says "all processes of reasoning, however abstract, are participated in and influenced by feeling"; yet he also says in the same lecture "the only quality we know of which can be *completely* abstracted is number." Is this really an exception? I well remember the intense surprise and pleasure I experienced when as a boy my mathematical master showed me that the indeterminate number $\sqrt{2}$ was represented geometrically by the hypotenuse of an isosceles right-angled triangle. It was only on mature consideration years afterwards that I realised that this

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simple example embodied problems of numbers discussed, but unsolved, by such great mathematicians as Henri Poincaré and Bertrand Russell. The truth of the matter is that a *pure* abstraction—*reine Vernunft!*—is as imaginary as a *pure* sensation.

If Head is right in "localising" the dyscritic, emotion-charged systems in the optic thalamus, it would seem that we are still essentially "thalamic animals"; that the drive to action is essentially emotional; that cortical inhibitory and other control is still in its infancy; that reasoning is used almost entirely to rationalise actions already performed under the urge of emotion; and that it is only very rarely indeed that actions are primarily dominated by reason. Moreover, when actions *are* carefully planned by reason, with all the elimination possible of emotional and other extraneous factors, they are founded upon ideologies, which owing to the complexity of the innumerable variables, should be granted only the validity of tentative hypotheses and should from the earliest stage of action be submitted to reconsideration and the subsequent actions modified according to the dictates of trial and error.

When all is said and done, there still remains the ethical factor!

Alwoodley, Leeds. J. HERBERT PARSONS.

FEEDING OF PREMATURE INFANTS

SIR,—By emphasising the water requirements of the premature baby, Dr. Ford in his article of June 11 has rendered a useful service. I have already pressed for more attention to this subject [1] and agree with him that tube-feeding has been a major advance. One might go further, indeed, and investigate the possibilities of the intra-œsophageal drip in very young premature babies; but expert nursing is here especially important.

I must join issue with Dr. Ford, however, over the advisability of giving the premature infant its full fluid requirements by mouth on the first day of life. Most will agree that this would be desirable if it were possible, but experience shows that it is possible only sometimes in the bigger and more mature baby. To make it a rule-of-thumb for infants of whatever size and maturity seems to me dangerous, especially since it is admitted that nurses skilled in the care of the premature are scarce. The mortality figure for the two special units referred to in table VII of the paper was 13%, while that in the other four units was 36% (see table VI). This striking difference is attributed to infection, but it might well have been due to the nurses in latter units being less skilled and less aware of the dangers of overdistension of the stomach. I am particularly apprehensive of the advice given to such nurses to find out from a table the quantity of feed to give a baby, although I concede there is no objection to giving them, merely for guidance, a flexible routine. Each premature baby is a feeding problem to itself, and it is therefore impossible to lay down hard and fast rules. Dr. Ford must have been exceptionally lucky to get his babies to toe the line.

It is true that necropsy studies give a fallacious idea of the capacity of the stomach, but overdistension of the stomach can be recognised clinically by cyanosis and/or vomiting. In the two special units, these symptoms would have been recognised as danger-signals and the amount of fluid reduced by the experienced nurses in charge; but can one be sure that the less skilled and perhaps more obedient staff in the other four units would do so equally promptly? The danger of aspiration of vomit is so real that one would like to know the causes of death in the 623 cases mentioned in tables VI and VII and how many were confirmed post mortem.

There seems to have been undue haste as well in increasing the calorie value of the feeds given, Dr. Ford reaching the optimum on the third or fourth day irrespective of the degree of immaturity of the baby. He bases this practice on the metabolic needs, but does not quote Gordon,[2] who states that these needs would be met by only 20–25 calories per lb. body-weight for the first week. Feeds of too high a calorie value given too early may well strain an immature digestive apparatus, and gastro-intestinal upsets which were put down to infection may well have been due to overfeeding in the first instance.

Notwithstanding these criticisms, which are after all merely a matter of opinion, one can have nothing but admiration for the results achieved in the two special units (see table VII) as against those obtained in the other four units. The data given, however, are insufficient to attribute the excellent results to the feeding methods advocated. Indeed Dr. Ford makes no such claim, but one would be grateful to him if, in a future study, he could use his régime in half his cases in the special units and use, say, Mackay's régime in the other half as a control, with comparable birth weights, recording the number of instances in which the full fluid requirements had to be reduced during the first week of life. The opportunity might also be taken to conduct a more scientific survey of the relative merits of breast, dried, and evaporated milks by feeding an approximately equal number of babies on them in each birth-weight group.

London, W.1. S. B. DIMSON.

1. Dimson, S. B. *Med. Pr.* 1948, **220**, 514.
2. Gordon, H. H. *Amer. J. Dis. Childh.* 1947, **73**, 713.

HORMONE TREATMENT OF SEXUAL OFFENDERS

SIR,—I read with interest the article by Dr. Golla and Dr. Sessions Hodge in your issue of June 11, and think that I should record that their experience of the treatment of excessive libido with œstrogens is the same as my own.

It may not always be necessary to abolish libido completely, and therefore it has been my practice to use smaller doses than theirs. I have observed that 6 mg. of dienœstrol or 0·1 mg. of 'Eticyclin' daily may be sufficient to reduce, but not to abolish, this troublesome symptom. I presume that œstrogens act by inhibiting the output of pituitary gonadotrophin and thereby reduce the activity of the testicular interstitial tissue. At the same time it will also depress spermatogenesis, and before such treatment is embarked upon the patient should be warned that a side-effect may be sterility while he is taking the œstrogen.

London, W.1. A. W. SPENCE.

NEEDLE-LESS INJECTOR

SIR,—Your annotation of June 4 seems to present far too rosy a picture of this new invention, unless the new model is an enormous improvement on the type sent to me in 1947 for trial for insulin injections. A party of experts collected for the trial, I was the subject—and a great party it was! The injector was heavy and clumsy and slippery, and required some 8 different manipulations, and I emerged from the combat rather sore and hæmorrhagic. It seemed difficult to know how much of the injected material remained in the skin or lodged in the subcutaneous or even muscular tissues. It was obviously impossible to give an accurate measured number of insulin units by the apparatus. And so I think we should regard this innovation, inevitably an expensive dollar machine, with very guarded judgment. Personally I prefer an almost painless prick to a noisy blow from a hammer.

London, W.1. R. D. LAWRENCE.

Public Health

Typhoid Fever at Fulham

BETWEEN May 29 and June 5, 5 cases of typhoid fever have occurred in Fulham, in children aged 4–14 years. One case, in a girl aged 10, proved fatal. All 5 patients were living close to each other in the south-east part of the borough, and all were infected with the same Vi-phage type of organism (D1). Inquiries have failed to bring to light a common aliment, although all are known to have eaten ice-cream from itinerant vendors about the presumed date of infection. A small number of suspects admitted to hospital have proved to be uninfected.

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Obituary

JAMES PURVES MORISON PURVES-STEWART

K.C.M.G., C.B., M.A., M.D. EDIN., F.R.C.P.

Sir James Purves-Stewart, consulting physician to the Westminster Hospital, died at his London home on June 14, at the age of 79. We owe the following memoirs to former colleagues.

* * *

Although to the present generation only a name sustained by his well-known textbook, Sir James Purves-Stewart was a conspicuous figure in the world of medicine and particularly neurology until his premature retirement, eighteen years ago, from the staff of the Westminster Hospital. Several circumstances contributed to the production of a notable personality—his early successes, his talent, his appearance, and his mannerisms. As a student in Edinburgh his career was remarkable. He was a Vans Dunlop scholar, and a university medallist in such varied subjects as chemistry, pathology, anatomy, medicine, and surgery; and, as might have been expected, he won the Ettles scholarship as most distinguished graduate of his year (1894). After some experience on the Continent and a resident appointment at Queen Square, he was elected, at the early age of 29, to the staff of Westminster Hospital. He had determined on a career in neurology—a specialty for which his temperament was particularly appropriate.

[Press Portrait Bureau

During the ten years of our professional association he was, in his early fifties, at the height of his fame, with an inexhaustible energy which proved only too exhausting to all coöperating in a ward round. He recalled the typical Continental savant with his dress and dapper accessories, the little Napoleon beard which at that time he still retained, and above all his short rapid movements as he flitted from bed to bed, his volubility, and his penchant for gesture. His early training and all-round ability suited him for the rôle of general physician, and indeed he was at some pains to assert that as senior physician to a teaching hospital he should be so regarded; but he had little interest outside neurology, nor would this have been possible considering his application to the minutiæ of his fast-developing specialty. As a teacher of undergraduates he did not rank high, for his vitality demanded too rapid results; preferring the didactic to the Socratic method he made a far stronger appeal to postgraduates; and as a demonstrator he was superb. He was, in a word, a fine showman.

His literary output was at one time enormous, but during the latter half of his professional life he restricted himself to his well-known *Diagnosis of Nervous Diseases* which was designed to describe clinical facts in everyday neurological practice and their diagnostic significance. An omnivorous reader with exceptional linguistic attainments, he applied himself to a constant scouring of the world literature in order that every detail of neurological research and progress should be incorporated. It was sometimes represented that his own research contributions were not considerable; but that does not depreciate the value of a highly instructive work, attractively presented; the many editions in English and translations into French, German, Spanish, and Arabic testify to its popularity. Of his other books, *Intracranial Tumours* (1927) and, with Mr. Arthur Evans, *Nerve Injuries and their Treatment*, were equally successful, though the former deserved more appreciation than was accorded it.

Through his love of travel and his flair for languages, he established innumerable contacts throughout America and the Continent; and in his heyday he was often accompanied on his ward round by distinguished colleagues from afar; he particularly cherished the opportunity of entertaining Babinski on several occasions. Despite the difficulty of travelling at an advanced age, he visited the Neurological Congress at Paris two years ago.

His virtues had their defects: his manifestations of vitality could sometimes be interpreted as self-advertisement, and his almost exaggerated patriotism exposed him to a charge of vanity. Certainly he was proud of his military service, first with the Imperial Yeomanry Field Hospital in the South African campaign, and later as consulting physician in the Mediterranean in the first world war. But his books, *A Physician's Tour in Soviet Russia* and *Over Military Age*, were, I am sure, inspired not by any desire for self-glorification or display but by sincere regard and anxiety for the future of his country. Though he made no secret of his satisfaction with his achievements, he never paraded his honours unduly, and so far as professional distinctions were concerned he was ever generous in his estimates of others and particularly of his juniors.

Outside his work, his chief interest was his Belle Toute lighthouse on Beachy Head; and he resented to the end the mutilation which his cherished possession had received from gunfire practice during the war.

His last years were clouded by disabilities which he attempted to belittle with the reiterated assurance that he had had a very good life. But more than reduction in physical activity he deplored increasing deafness which restricted his contacts and frustrated the craving to remain au fait with the many interests established in a full and busy life. As a refuge he would talk reminiscently of the neurological giants of his youth—of Hughlings Jackson, of Gowers, of Ferrier—with a regard amounting to idolatry.

He may not have been a great neurologist. He may have failed to ensure eponymous survival. But he did not a little to carry the spurt of British medicine to many lands and to consolidate an entente cordiale. A figure of no slight significance has gone from our profession.

A. A.

I first met Purves-Stewart when I became his clinical assistant at the West End Hospital for Nervous Diseases in 1913. I recall him then as a keen and earnest worker in neurology, and one more interested in the practical side—clinical diagnosis and therapeutics—than the more academic or neurophysiological aspect. He preferred to make his own notes—in his characteristic microscopical writing—rather than to use his clinical assistant as clerk. He explained his minute calligraphy—not easy sometimes to decipher—on the grounds that he managed to get much more matter on a page than the average person. Thus of the elaborate series of notebooks in which he recorded his more interesting cases, each contained at least twelve times as much material as the usual notebook.

It sometimes caused me surprise that Purves-Stewart did not become a surgeon, for punctures and injections fascinated him—especially injections for trigeminal neuralgia, cisternal puncture, and ventricular puncture. He would perform his own ventricular punctures, and in later years ventriculograms, by means of a puncture through a small hole made by a drill he had especially devised.

He was able to elicit the history and symptoms of a patient in many European tongues—French, German, Italian, and to a certain extent Spanish. He told me that he had learned and practised all the colloquial side of his languages in the outpatient department of the West End Hospital for Nervous Diseases, where before the first world war and between the two wars many more foreigners attended even than at present.

He resigned from the West End Hospital before the usual retiring-age—a step which he afterwards regretted, for he was not seeing enough neurological material at a general hospital and would have liked to return if the vacancy had not been filled.

Purves-Stewart had an intrepid and adventurous spirit; and he was intensely patriotic. On casual acquaintance he might be regarded as an austere personality and lacking a sense of humour. On knowing him better, however, one found that the humour was certainly

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there; it was manifested by occasional flashes of sparkling wit. If it was his opinion that the medical man was "worthy of his hire," he nevertheless had a kindly heart for those in distress and particularly for those suffering constant pain. His firm advocacy of euthanasia was an outcome of this sentiment.

C. W.-D.

Sir James Purves-Stewart was appointed C.B. in 1916 and was created K.C.M.G. in 1918. He held the honorary rank of colonel. He served as president of the neurological section of the Royal Society of Medicine, and was a member of Lloyd's and a freeman of the city of London. In addition to the works already mentioned he wrote *Healing of Nerves* (with Sir Charles Ballance), *Robert Burns—a Medical Aspect* (1935), and *Sands of Time* (autobiography, 1939). A further edition of *Diagnosis of Nervous Diseases* is to appear shortly.

He is survived by his second wife.

NIKOLAI ALEXANDROVICH SEMASHKO

Professor Semashko, whose death at the age of 75 has lately been announced, was the first people's commissar of health for the U.S.S.R., and also the first professor of social hygiene at Moscow University. The son of a teacher, he was exiled for organising student demonstrations, but settled in Kazan suburb in disguise and managed to attend the university and take his examinations. He left Russia in 1907 and went with Lenin to Paris in 1911. In February, 1917, he returned to his own country, and was soon foremost in urging the need for medical care of the workers. He was given the health commissariat in June, 1918, and held it for twelve years: the remarkable system he did much to establish is described in his *Health Protection in the U.S.S.R.* published in this country in 1934. From 1921 until his retirement from active life he occupied his Moscow chair. He was also chief editor of the *Soviet Medical Encyclopædia*.

Births, Marriages, and Deaths

BIRTHS

CADMAN.—On June 9, in London, the wife of Dr. D. S. Cadman—a son.

GILLERAN.—On May 21, the wife of Dr. J. J. Gilleran—a daughter.

GUMMER.—On June 11, at Norwich, the wife of Mr. J. W. P. Gummer, F.R.C.S.—a son.

HENDERSON.—On June 9, at Leeds, the wife of Mr. William R. Henderson, F.R.C.S.—a daughter.

HILL.—On June 15, the wife of Dr. S. M. B. Hill—twin daughters.

MACARTHUR.—On June 13, in London, to Dr. Hilary Macarthur (née Parton), wife of Mr. Angus Macarthur, F.R.C.S.—a daughter.

PLUMMER.—On June 12, in London, the wife of Dr. N. S. Plummer—a daughter.

REEKS.—On June 15, at Paignton, Devon, the wife of Dr. J. J. Reeks—a son.

TIZARD.—On June 11, in London, the wife of Dr. Peter Tizard—a son.

WESTALL.—On June 12, in London, the wife of Dr. P. R. Westall—a daughter.

WILLIAMS.—On June 13, at Southsea, the wife of Mr. Bernard Williams, F.R.C.S.—a son.

YEOMAN.—On June 16, at Cambridge, the wife of Dr. Philip Yeoman—a son.

MARRIAGES

DE BARY—GREEN.—On June 11, at Winchelsea, Sussex, John L. J. de Bary, M.R.C.S., to Margaret Imogen Green, M.R.C.S.

EVANS—THORNTON.—On May 28, at Buckhurst Hill, Essex, Arthur James Evans, M.R.C.S., to Dilys Olga Thornton.

LOWIS—MORGAN.—On June 10, in London, Dr. Robert Lowis, M.R.C.S., to Enid Morgan.

WATTS—WATT.—On June 11, at Singapore, William John Watts to Anne Brown Watt, M.B.

DEATHS

CONNELLAN.—On June 16, in London, Edmund V. Connellan, M.R.C.S.

ELLIOTT.—On June 10, Charles Morton Gavin Elliott, M.D. Edin.

FISCHER.—On June 15, at Crowborough, Sussex, Ernest Cotton Fischer, M.D. Edin., F.R.C.S.E., aged 83.

FROST.—On June 1, at Reading, Augustine Thomas Frost, O.B.E., M.B. R.U.I., lieut.-colonel, R.A.M.C. retd, aged 71.

JONES.—On June 15, at Hertford, Evan Jones, M.R.C.S.

KEIR.—On June 12, William Wallace Keir, C.M.G., M.B. Glasg., surgeon rear-admiral, retd, aged 72.

MAURICE.—On June 19, at Marlborough, Dr. Kindersley Maurice, D.S.O., M.C., M.R.C.S., colonel, late R.A.M.C. and Sudan Medical Service, aged 62.

MULLINGS.—On June 12, William Thomas Mullings, M.D. Camb.

PURVES-STEWART.—On June 14, in London, Sir James Purves-Stewart, K.C.M.G., C.B., M.A., M.D. Edin., F.R.C.P., aged 79.

SLATTERY.—On June 10, at Totnes, Devon, James Beary Slattery, M.D. R.U.I.

Notes and News

CORNEO-PLASTIC UNIT AND EYE BANK

THE South-East Metropolitan regional hospital board has approved the establishment of a corneo-plastic unit and eye bank in connexion with the plastic centre at East Grinstead. It is under the direction of Sir Archibald McIndoe in conjunction with Mr. B. W. Rycroft. This unit deals especially with cases of corneal graft and the eye complications of maxillofacial trauma, such as canthorhinostomies, socket and orbit reconstructions, paralyses of extra-ocular muscles, ptosis, and the various types of enucleation implants. Beds have been set aside for the purpose and a Marks scholarship has been allocated for clinical research in these subjects. Demonstrations and courses of instruction will be arranged from time to time. The eye bank is additional to the existing cartilage bank. Special facilities such as superficial X-ray therapy for corneal-graft cases are available, and a photographic unit provides serial records in every case. During the war the value of combined specialist teams in dealing with head, maxillofacial, and eye injuries was fully proven, and it will be the endeavour of the corneo-plastic unit to fulfil similar functions in peace-time.

AT THE FILMS

THE new films *Elimination*, *Circulation of the Blood*, and *Digestion* have been completed by G. B. Instructional Ltd. These are composed entirely of coloured diagrams, which, in conjunction with the dialogue, are easily understood. Their simplicity would recommend them for showing to pre-nursing students and nurses studying their first course of anatomy in the preliminary training school. *The District Nurse*, also produced by G. B. Instructional, should be of great interest to the general public and also to nurses, especially those who have nearly finished their training and are not sure what district nursing entails.

University of Oxford

Dr. E. M. Vaughan-Williams has been elected to the Schorstein research fellowship in medical science for 1949.

University of Sheffield

The following appointments to part-time lectureships are announced: neurology, Dr. James Carson; medicine, Dr. K. J. G. Milne and Dr. E. G. G. Rhind; surgery, Mr. J. T. Chesterman, Mr. F. J. P. O'Gorman, and Mr. S. Pappworth; obstetrics and gynæcology, Mr. David H. Lees.

University of Leeds

Dr. W. K. J. Walls has been appointed lecturer in anatomy.

Harveian Society of London

"We live more unhealthily every day," said the Archbishop of Canterbury at this society's Buckston-Browne Gray-Hill dinner, held at the Royal College of Surgeons on June 16. He was referring to the shift of populations from country to town. Yet despite this shift death-rates were coming down; and he applauded the contribution of doctors to this trend. After appealing to the profession to have no hand in the euthanasia movement, he concluded with the rueful observation that the medical no less than other professions was the victim of growing specialisation. The Archbishop was proposing The Society, and in reply Dr. Desmond Macmanus, its president, explained that this body protected itself against narrow interests by electing a general practitioner as president every third year. It was, he continued, his duty to expound some aspect of Harvey's life and work; and since this duty had fallen to 126 previous presidents it was not easy to break fresh ground. He chose to dwell on Harvey's loyalty and his curiosity. During his life Harvey dissected over 80 different species of animals; and the president pictured him as he rode through a country lane, slapping his thigh and exclaiming: "By Charles, the thing works like a bellows." Thus the secret of the circulation was disclosed. Harvey's loyalty was evident in his relation to the two young princes; and unhappily he died just three years before the Restoration. Speaking of The Guests, Dr. R. P. K. Coe recalled that Vice-Admiral Sir Thomas Troubridge was famed in the Navy for his civility; to a wayward ship in a force he commanded during the war, he signalled simply: "Unless you come a little closer we shan't be able to see you." To Mr. Russell Vick, K.C., he referred as "the co-author of last year's best-seller."

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Royal Academy

Mr. Henry Lamb, M.C., L.M.S.S.A., has been elected a Royal Academician.

Cambridge Graduates Medical Club

The annual dinner will be held at Pembroke College on Friday, July 8, at 8 P.M. Guests may be invited by members, and further information may be had from the hon. secretary, Dr. Windsor H. Lewis, 56, Trumpington Street, Cambridge.

St. John's Hospital Dermatological Society

The Prosser White annual oration of this society is to be delivered by Prof. Marion B. Sulzberger (New York) at 1, Wimpole Street, London, W.1, on Wednesday, July 6, at 4.30 P.M. Dr. Sulzberger's title is Allergy—a Dermatologist's Reminiscences and Speculations.

Patients' Paintings

An exhibition of paintings by patients at the Netherne Psychiatric Hospital, Coulsdon, Surrey, is to be opened at midday on July 11 by the Countess of Limerick. The exhibition will remain open until July 16. Between Monday, July 11, and Friday, July 15, a series of five lectures will be delivered at 3 P.M. by Mr. E. J. Adamson, Dr. F. Reitman, Dr. E. Cunningham Dax, Dr. Sybille Yates, and Dr. R. K. Freudenberg.

Hospital Accommodation for Officers

Hospital authorities have been informed by the Ministry of Health that officers up to and including the ranks of lieut.-commander, major, and squadron-leader should be accommodated wherever possible in a bed in a single room or small ward, whether or not it is approved as a section-4 bed. Where no such bed is available they should be admitted to a section-5 bed and treated, if the arrangements with the medical staff permit it, at inclusive charges; if not, they should be treated as private patients of the practitioners concerned. Officers above these ranks should always be admitted to section-5 accommodation.

Lord Horder's Speech in the U.S.A.

The *Daily Telegraph* (June 10) reports that Lord Horder addressing the convention of the American Medical Association at Atlantic City, charged the "reactionaries" responsible for socialising medicine in Britain with having "put back the progress of medicine, both in its art and its science, 100 years." "We have moved," he said, "from an attitude of dignity and calm detachment from political clamour to one of subservience to a doctrinaire Socialist adventure. We have become what we vowed at all costs we never would become—mere servants of the Bureau. You in America can, if you will, escape this peril. There is still time."

Commonwealth Tuberculosis Conference

The second Commonwealth and Empire Health and Tuberculosis Conference will open at the Central Hall, Westminster, on July 5 and will continue until July 8. Like the first conference, in 1947, this has been organised by the National Association for the Prevention of Tuberculosis. So far representatives from twenty-five Dominions and Colonies and visitors from twenty other countries have accepted invitations. Among the subjects to be discussed are tuberculosis as a world problem; trends in modern treatment; regional, county, and county-borough schemes; organisation of comprehensive schemes in British Colonies; problems in prevention and detection; psychological and social readaptation of chronic disease in industry; and protection from bovine infection.

Journal of the American Medical Association

Dr. Morris Fishbein is to be retired from the editorship of the *J.A.M.A.* as soon as his successor has been trained. According to a B.U.P. report from Atlantic City, where the association has been holding its annual meeting, the board of trustees has made it clear that Dr. Fishbein has been ordered to eliminate all public speaking except with prior official approval; and the editorial policy of the journal is to be more strictly controlled. "Over the last few months," says B.U.P., "criticism against Dr. Fishbein from inside the U.S. medical profession has been increasing. It is understood that his retirement is considered necessary before the association can unite for its fight against President Truman's health scheme." On his return from Europe last year, Dr. Fishbein severely criticised the British National Health Service scheme.

A Radio Review

Dr. J. L. Halliday's book, *Psychosocial Medicine—a Study of the Sick Society*, is to be reviewed by Prof. L. J. Witts, F.R.C.P., in a Third Programme broadcast on Friday, July 1, at 11.40 P.M. This is a repeat of a broadcast on April 12.

Analysis of Nurses' Work

The Nuffield Provincial Hospitals Trust, which has been conducting a job-analysis of the work of hospital nurses, is to start a similar investigation in the field of public-health nursing, including health visitors, home nurses, school nurses, tuberculosis visitors and nurses, and clinic nurses, but excluding midwives.

Mr. H. J. Seddon has been appointed a corresponding member of the Academy of Surgery of France.

At the invitation of the National University of Colombia Mr. Ronald Raven and Dr. Laurence Morris have spent five weeks giving lectures and demonstrations in the teaching hospitals of Bogota, Medellin, and Cartagena. Mr. Raven has been elected honorary professor of the university.

Diary of the Week

JUNE 26 TO JULY 2

Tuesday, 28th

INSTITUTE OF DERMATOLOGY, 5, Lisle Street, W.C.2
5 P.M. Dr. R. M. B. MacKenna: Background of Occupational Dermatoses.

YORKSHIRE SOCIETY OF ANÆSTHETISTS
4.30 P.M. (General Infirmary, Leeds.) Prof. Robert A. Hingson (U.S.A.): Continuous Conduction Anæsthesia in the Treatment of Vasomotor Crises.

Thursday, 30th

INSTITUTE OF NEUROLOGY, National Hospital, Queen Square, W.C.2
5 P.M. Prof. Geoffrey Jefferson, F.R.S.: Rathke's Pouch Tumours.

INSTITUTE OF DERMATOLOGY
5 P.M. Dr. Harold Corsi: Acne.

ST. GEORGE'S HOSPITAL MEDICAL SCHOOL, S.W.1
4.30 P.M. Dr. Denis Williams: Neurology lecture-demonstration.

ROYAL SOCIETY, Burlington House, Piccadilly, London, W.1
4.30 P.M. Prof. D. W. Bronk: Rhythmic Action and Respiration of Nerve-cells. (Croonian lecture.)

BRITISH ASSOCIATION OF UROLOGICAL SURGEONS
10 A.M. (Royal College of Surgeons, Lincoln's Inn Fields, London, W.C.2.) Opening of three-day annual meeting.

Appointments

MONRO, A. B., M.B. Edin.: deputy superintendent, Carlton Hayes Hospital, Narborough.

NEWNHAM, C. T., M.R.C.S., D.O.M.S.: medical officer, British Railways, Western Region.

Newcastle-upon-Tyne Regional Hospital Board:

MILLMAN, C. G., M.R.C.S.: superintendent, mental deficiency institutions of Northgate and district hospital management committee.

SMITH, D. F., M.B. Aberd., F.R.C.S.E., M.R.C.O.G.: asst. obstetrician and gynæcologist, Queen Elizabeth Hospital.

North-West Metropolitan Regional Hospital Board:

DAVIES, H. R., M.A., M.D. Dubl., D.PHYS.MED.: physician in charge of physical medicine, West Herts and Mid-Herts groups of hospitals.

EASTON, J. L. H., M.A., M.D. Camb., M.R.C.P.: physician to St. Peter's Hospital, Bedford, and Bedford County Hospital.

St. Andrew's Hospital, Bow, E.3:

KING BROWN, R., M.D. Lond., M.R.C.P.: senior resident physician.

LASK, S., M.D. Leeds, M.R.C.O.G.: assistant specialist obstetrician and gynæcologist.

Colonial Service:

ANDERSON, R. E., M.B. St. And.: superscale M.O., Malay.
BEVAN, C. E., M.R.C.S.: M.O. specialist (tuberculosis), Cyprus.
COLE, A. C. E., M.D. Camb., M.R.C.P.: medical specialist, Tanganyika.
FIELD, J. W., M.D. Birm.: director, Institute of Medical Research, Malay.
GOODEY, J., M.R.C.S.: M.O. specialist, Jamaica.
HEISCH, R. B., M.B. Camb.: senior pathologist, Kenya.
JOHNSTON, R. S., M.B. Belf.: superscale M.O., Malay.
MCDONALD, J. F., M.B. Edin., F.R.C.S.E.: senior specialist (surgical), Northern Rhodesia.
MACKENZIE, D. J. M., O.B.E., M.B. Edin.: D.M.S., Nyasaland.
MCLEAN, E. M., M.D., L.M.S. Nova Scotia: M.O., Trinidad.
MCSHINE, L. A. H., M.B. Lond., F.R.C.S.E.: M.O., Trinidad.
MILNE, J. C., M.B. Aberd.: superscale M.O., Malay.
SCRIMGEOUR, H., M.B. St. And.: superscale M.O., Malay.
SINDHU, M. S., M.B., F.R.C.S.: M.O., Aden.
STRANG, T. F., M.B. Glasg.: superscale M.O., Malay.
TAYLOR, J., M.B. Glasg.: M.O.H., Fiji.
THOMAS, W. R. G., M.B. Lond.: M.O., Tanganyika.
WILLIAMS, C. H., M.B. N.Z.: superscale M.O., Malay.

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